STUDIES ON THE TAXONOMY AND DIVERSITY OF ACRIDIDAE (ORTHOPTERA: ACRIDOIDEA) IN NORTH EASTERN STATES OF INDIA

ABSTRACT
THESIS

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By

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THESIS


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All the economically important species belonging to the Superfamily Acridoidea are commonly known as locusts and grasshoppers. Sometimes they are called short-horned grasshoppers in contrast to Ensifera (Tettigonoidea and Grylloidea) or long-horned grasshoppers which constitute one of the other suborders of Orthoptera. India provides a unique variety of habitats for this groups of insects. They exist in humid grassland in East and North-East India, semi-arid grass plains in the Nort-West and Southern parts of India.

No survey work so far has been done exclusively for this group from North-Eastern region of the country. There are very few reports on the taxonomy of Acrididae from North-Eastern States of India. Except for some sporadic reports, there is no systematic study on the locusts and grasshoppers belonging to the family Acrididae from North-Eastern states in India, a hot spot of Biodiversity. Keeping in view the above fact, the present study has been done to study the locust and grasshopper fauna of North-Eastern region of India and to begin with, the present work was aimed at studying one of the families of Acridoidea which is most widely distributed and show a very high degree of biological diversity.

Meghalaya represents the most diverse state in having most number of specimens as well as number of genera while the least number of specimens and genera were recorded from Tripura and Sikkim. While other states were represented by moderate number of genera belonging to different subfamilies. This may be attributed to the fact that Meghalaya is having the higher forest cover area as well as grasslands as compared to other states. Extensive surveys of these areas were made which results in good diversity as depicted in the results. At sub-familial level Oxyinae was found to be the most diverse subfamily in Assam, Manipur, Meghalaya, Nagaland and Tripura this may be due to the fact that the members of this subfamily prefer feeding on paddy

cultivation and grasses, which are prevalent during the survey period. Shannon's diversity index is used for estimating diversity of regions. In present study Shannon's diversity was calculated at genus level. It was found to be highest in Meghalaya, followed by Manipur, Arunachal Pradesh, Assam, Nagaland, Sikkim and Tripura. The fluctuations in diversity index can be well explained on the basis of number of genera in different states. Margelef's diversity was highest in Meghalaya, followed by Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim and Tripura.

The present study is aimed at studying large number of species of Acrididae which were collected from different states of North-Eastern states of India. Their diversity and frequency of occurrence in different regions and habitat were calculated. The status of various characters used in the identification were judged on the basis of their consistency and variation to ascertain their importance in the group. The identification keys have been prepared to make identification easy.

Besides the external characters, the present work includes the identification based on more significant genitalic structures particularly epiphallus, aedeagus and spermatheca that makes it possible to put forward some suggestions regarding interrelations of families and subfamilies of Acrididae more clearly than the external characters. In present study ten subfamilies (Gomphocerinae, Acridinae, Oedipodinae, Oxyinae, Spathosterninae, Tropidopolinae, Cyrtacanthacridinae, Coptacridinae, Eyprepocnemidinae and Catantopinae) belonging to the family Acrididae were recorded from these states. Both generic and sub-familial diversity have been studied.

The studies on the taxonomy of locusts and grasshoppers (Acrididae) of North-Eastern states of India could be summarized as follows:

1. The subdivision of the superfamily Acridoidea into families, subfamilies, tribes and groups as adopted by earlier authors is discussed. In present study family Acrididae is treated as distinct family with Catantopinae as its subfamily.

2. The present study is based on the fresh material collected during the course of survey (2008-2011) from various agricultural areas of different States of North-Eastern regions of India.

3. The North-Eastern states surveyed during this study are as follows: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. Topography of states is also provided.

4. The survey yielded a good number of specimens (1,347) belonging to the family Acrididae. The collected specimens were identified up to the species and subspecies level. This represents the first systematic collection of locusts and grasshoppers from the area.

5. In addition to systematic studies, observations were also made on the distribution and diversity of the acridoid fauna. Each sample collected and all specimens are recorded with bio-ecological observations and other relevant data. This makes the collected material extremely valuable. In terms of published documentation, the Acridid fauna of North-Eastern states of India is poorly known. However, collection of Acridid fauna during the past three years results in an excellent representation of the Acrido-fauna from all states of North-East India. All the specimens were preserved and deposited in the museum collection of the Department of Zoology, Aligarh Muslim University, Aligarh.

6. In the present work, 360 specimens of Acrididae were collected from Meghalaya belonging to ten subfamilies, twenty one genera and twenty four species. One genus

and two species were recorded as new to science from this region. 219 specimens of locusts and grasshoppers from Arunachal Pradesh were collected. Sixteen species belonging to five subfamilies and twelve genera have been recorded. 172 specimens of Acrididae from Mizoram represent eight species belonging to eight genera and four subfamilies. 150 specimens of locusts and grasshoppers from Assam belonging to seven subfamilies, twelve genera and fourteen species were collected. One species is recorded as new to science from this state. From Manipur, 145 specimens of Acrididae were collected belonging to seventeen species, fourteen genera and seven subfamilies. Nagaland, Tripura and Sikkim were represented by 123, 95 and 83 specimens respectively from each state.

7. Shannon's diversity index and Margelef's diversity index were used for estimating diversity of regions. Meghalaya was found to be the most diverse state when Shannon's diversity index and Margelef's diversity were calculated at genus level. In present study Shannon's diversity found to be highest in Meghalaya, followed by Manipur, Arunachal Pradesh, Assam, Nagaland, Sikkim and Tripura. The fluctuations in diversity index can be well explained on the basis of number of genera in different states. Margelef's diversity index was highest in Meghalaya, followed by Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim and Tripura.

8. Altogether, a total of fifty seven species belonging to fourty one genera distributed in ten subfamilies were recorded from eight North-Eastern states of India. From these subfamilies, one genus and two species were recorded as new to science.

9. The present study is based on the conventional as well as genitalic characters. A detailed comparative study on genitalic structures viz., supra-anal plate and cerci, subgenital plate, epiphallus and aedeagus of male; subgenital plate, supra-anal plate and

cerci, ovipositor and spermatheca of female was carried out. Significance of these characters in the classification of Acridoidea is shown.

10. Taxonomic significance of epiphallus and spermatheca in various families and subfamilies of Acridoidea is already known. However, the available literature shows that the taxonomic significance of supra-anal plate and subgenital plate has not been shown. In the present work significance of these characters in Acrididae is shown for the first time. Shield or bridge-shaped condition of epiphalius; presence or absence of dorso-lateral appendices. Oval sclerites and lophi on epiphallus; divided, undivided or flexured condition of aedeagus; presence or absence of gonopore process on aedeagus; long or short condition of apical and tubular or sac-like condition of pre-apical diverticula of spermatheca are taken as stable characters for separating various subfamilies.

11. Presence or absence of ancorae on epiphallus; long or short condition of aedeagal sclerites; long or short condition of ovipositor valves; shape of diverticula of spermatheca; presence or absence of Jannone's organs and setae on posterior margin of female subgenital plate are used for separating subfamilies. Long or short condition of ancorae on epiphallus, broad or narrow condition of bridge, mono, bi or trilobate condition of lophi, upcurved or downcurved condition of apical valves of aedeagus, apical valve longer or shorter than basal valve; shape and length of basal and apical valves of aedeagus; length of ovipositor valves in relation with the lateral apodeme, shape of male and female supra-anal plate and cerci, shape of male subgenital plate as a whole and shape of posterior margin of female sugenital plate are suggested as useful generic characters. Shape and length of male and female cerci; shape and length of apex of male subgenital plate, length and shape of egg-guide of female subgenital plate, shape of ovipositor valves and their apical tips, presence or absence of spines, tubercle

on posterior ventral basivalvular sclerites of ovipositor; shape of ancorae and lophi of epiphallus; shape of apical and basal valve of aedeagus; presence or absence of protuberance on pre-apical diverticulum are considered as characters of specific significance. These characters along with already recognized coventional characters have made the identification of subfamilies, genera and species more stable and practicable.

12. Brief diagnosis and keys to subfamilies, genera and species found during the present study are given. In the key besides using the conventional characters proposed by earlier workers, some additional characters of male and female genitalic structures are also incorporated. All the species recorded from this region are provided with photographs, description and illustrations of genitalic structures. Distribution and host plant data are given for all the species.

13. Generic and specific synonymies are quoted. Authors who synonymised the genera and species cited in brackets after authors of respective taxa. The terminology of the morphological characters used in the present work is the same as in Dirsh's The African genera of Acridoidea, Cambridge, 1965.

14. The present study is the first consolidated work and distinct addition to the existing knowledge on Indian Acrididae. It is supported by eighty one photographs, eight pie-charts, one graph and three hundred thirty three illustrations which are arranged in sixty plates.

15. Holotype, paratypes and other material collected during the survey is deposited in museum collection of the Department of Zoology, Aligarh Muslim University, Aligarh.

Table 1: Distribution of Grasshopper species in North-Eastern states of India

Subfamily	Species	States							
		Arunachal Pradesh	Tripura	Meghalaya	Assam	Mizoram	Sikkim	Manipur	Nagaland
GOMPHOCERINAE	*Brachycrotaphus longiceps*				+				
	Leva indica			+					
	Dociostaurus (D.) apicalis			+					
	Chorthippus indus			+					
	Aulacobothrus taeniatus			+					
	Aulacobothrus l. luteipes				+				
	Leinotacris bolivari			+					
ACRIDINAE	*Acrida exaltata*	+			+			+	
	Acrida gigantea	+			+				
	Phlaeoba infumata	+	+	+		+		+	
	Phlaeoba panteli		+	+			+	+	+
	Phloeba angustidorsis				+		+		
	Phloeba tenebrosa	+							
	Orthochtha indica			+		+	+		
OEDIPODINAE	*Sphingonotus c. caerulans*	+							
	Sphingonotus r. rubescens	+							
	Trilophidia annulata	+		+	+	+		+	+
	Trilophidia repleta	+							
	Aiolopus t. thalassinus	+							
	Aiolopus t. tamulus				+				
	Ceracris deflorata						+		
	Ceracris nigricornis			+					
	Heteropternis respondens	+				+		+	
	Dittopternis venusta	+						+	
	Chloebora marschalli					+			
	Scintharista notabilis		+					+	
OXYINAE	*Gesonula punctifrons*				+			+	+
	Oxya fuscovittata	+		+	+				+
	Oxya japonica vitticollis			+					

	Oxya velox		+					+	+
	Oxya chinensis				+				
	Oxya hyla hyla		+					+	+
	Caryanda paravicina			+				+	+
	Cercina mussoriensis				+				
	Lemba elongata sp. n.			+					
	Lemba motinagar			+					
	Pseudoxya dimunata			+					
SPATHOSTERNINAE	*Spathosternum p. prasiniferum*	+		+	+		+	+	+
TROPIDOPOLINAE	*Neooxyrhepes meghalayensis* gen n., sp. n			+					
	Oxyrrhepes obtusa					+		+	+
	Tristria pulvinata		+						
CYRTACANTHACRIDINAE	*Chondracris rosea*			+					+
	Patanga succinata				+				
COPTACRIDINAE	*Eucoptacra praemorsa*			+					
	Epistaurus aberrans		+						
EYPREPOCNEMIDINAE	*Eyprepocnemis alacris alacris*			+				+	
CATANTOPINAE	*Catantops erubescens*	+							
	Xenocatantops humilis					+		+	+
	Xenocatantops brachycerus	+							+
	Xenocatantops kamyl						+		
	Apalnlacris shillong			+					
	Palniacris rugulosa			+					
	Gerenia pustulipennis				+				
	Diabalocatanops consobrinus	+							
	Stenocatantops splendens						+	+	+
	Pachyacris violascens					+			
	Choroedocus robustus			+				+	+

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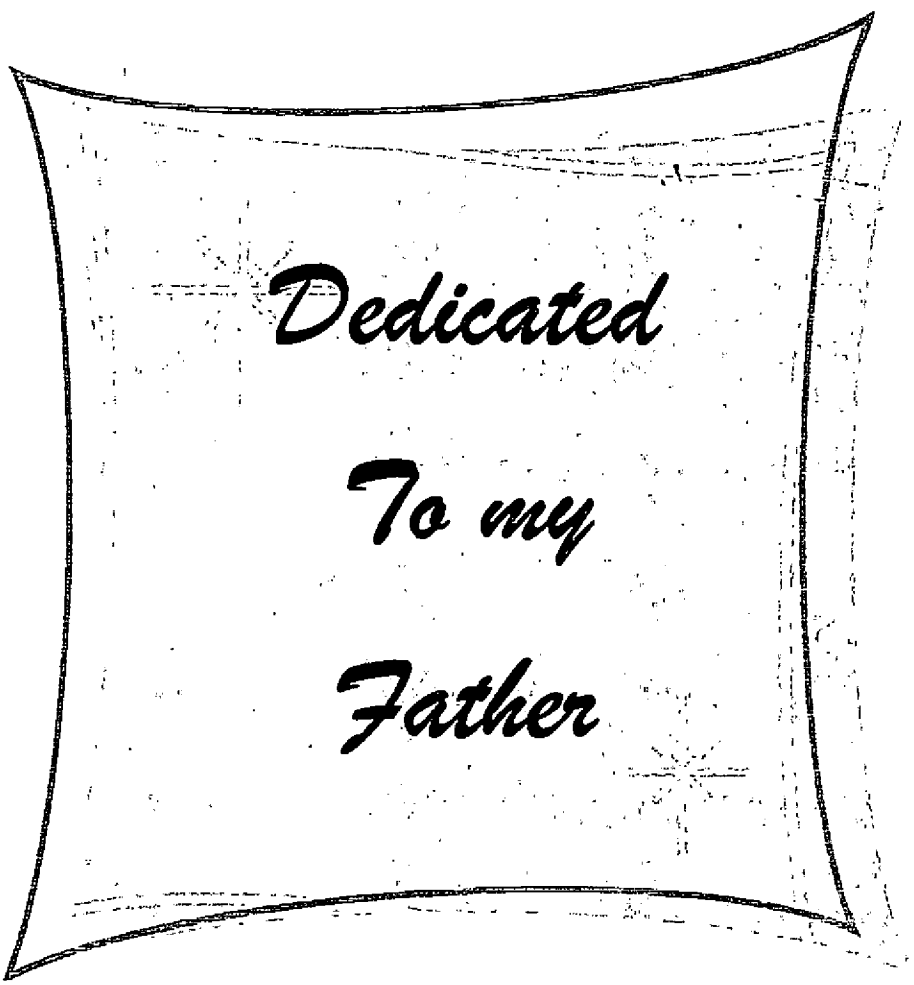

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CERTIFICATE

This is to certify that the entire research work presented in the thesis entitled "***Studies on the Taxonomy and Diversity of Acrididae (Orthoptera: Acridoidea) in NorthEastern States of India***" by Mohd. Imran Khan is original and was carried out under my supervision. I have allowed Mr. Imran to submit it to the Aligarh Muslim University, Aligarh in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Zoology.

(Dr. Mohd. Kamil Usmani)
Associate Professor

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Introduction

All the economically important species belonging to the Superfamily Acridoidea are commonly known as locusts and grasshoppers. Sometimes they are called short-horned grasshoppers in contrast to Ensifera (Tettigonoidea and Grylloidea) or long-horned grasshoppers which constitute one of the other suborders of Orthoptera. Suborder Caelifera is divided into four superfamilies viz. Acridoidea, Tridactyloidea, Tetrigoidea and Eumastacoidea. Acridoidea possess short antennae, usually shorter than the body and a short ovipositor and their tarsi are three-segmented. Superfamily Tetrigoidea is easily distinguishable from Acridoidea by the elongate pronotum, usually extending beyond the end of the body, by the absence of an arolium between the claws and the two-segmented tarsi of the fore and middle legs. The other superfamilies of Caelifera are easily recognizable at sight and are not frequently encountered. Superfamily Acridoidea has shown maximum diversity and divided into various families of which family Acrididae is widely distributed in India. Locusts and grasshoppers constitute an economically important group of Orthopterous pests that infest a number of cultivated and non-cultivated crops. They cause considerable damage to agricultural crops, pastures and forests and are well reputed for their destructiveness all over the world.

They are phytophagous in nature having biting and chewing type of mouth parts. Defoliation is the most common form of damage and ultimate effect of this upon the yield depends on when the crop is defoliated. Leaf destruction is not the only way in which they damage crop plants; for example, in maize, the male inflorescences and cobs are also eaten, while in wheat the stems just below the ripening ears may be bitten through, and the grains, both ripe and unripe is eaten (Bullen, 1969). Locusts and grasshoppers have invaded green crops from the earliest days to present time. Locusts are the main pests in countries bordering deserts. The devastations caused by migratory

swarms of locusts in Africa are well known. Swarms of the desert locust (*Schistocerca gregaria*) have plagued agriculture from the ancient recorded times, the eighth plague of Egypt recorded in the book of exodus (about 1300 B.C.) relates to this species. Locusts and grasshoppers are distributed throughout the world up to the sub-polar regions, but the number of the genera and species increase towards the equator. They flourish most in sub-tropical and tropical countries. Their control attracted greater attention of the economic entomologists, particularly due to locust plague. The distinction between grasshoppers and locusts is essentially based on the gregarious habits of the latter, which makes them particularly notorious as pests. Moreover, past and more recent findings show that non-gregarious grasshoppers are much more serious enemies of agriculture in many countries than the locusts. It is evident from the experience that in countries with rapidly expanding agriculture, grasshoppers almost invariably become major pests of crops. This devastations may be less spectacular than those caused by locusts, but they are more persistent so that the effect they leave on agricultural production and particularly on planned development is much more serious. Many species have already been recorded as occasional pests, but the damage is usually local and confined to native crops, so that it does not attract much attention.

The distribution pattern of grasshoppers is changing rapidly due to the encroachment of grasslands and forests for agricultural and industrial purposes. The species which were once abundant in the grassland and forest areas and never considered as pests now occur in huge numbers in the crop fields in the form of minor pests of a potential major pest, e.g. *Phlaeoba infumata, Atractomorpha crenulata and Oxya fuscovittata*, the former two species were once found only in the grass fields and latter was abundant in the aquatic weeds like water hyacinth, which are now considered as major pests of paddy and vegetables in some states of India.

India provides a unique variety of habitats for this groups of insects. They exist in humid grassland in East and North-East India, semi-arid grass plains in the Nort-West and Southern parts of India, vast agricultural fields, submountaneous forests and scrub jungles, vegetation adjoining lakes, river basins and numerous water bodies are scattered throughout the country. The economic importance of these insects have been recognized all over the world.

The best studied Acridoid faunas are the European and North American. The next best studied is that of African continent. Up to the end of 1958, between 1500 and 1550 genera and approximately 10,000 species of Acridoidea were known from the whole world (Johnston, 1958). In recent years much progress in the field of Acridology has been made due to outstanding contributions of Chopard (1943) on North African species, Bei-Bienko and Mishchenko (1951, 1964) and Mishchenko (1965) on locusts and grasshopper fauna of Russian and adjacent countries, Willemse (1951, 1955 and 1957) on the Acridoidea of Indo-Malayan and adjacent regions, Rehn (1953, 1957) on the grasshoppers and locusts (Acridoidea) of Australia, Dirsh (1965) on African genera of Acridoidea, Uvarov (1966) on General Acridology, Jago (1971) on Gomphocerinae of the world with a key to genera, Harz (1975) on European species, Roffey (1979) on Thailand species of locusts and grasshoppers, Johnsen (1982-1987) on Acridoidea of Zambia and in 1990 on Acridoidea of Botswana and Usmani and Ajaili (1991-2004) on Acridoidea of Libya.

Chapman & Robertson (1958), Phipps (1959-1970), Chapman (1962, 1964), Ramsay (1964), Descamps & Winterbert (1966), Dirsh (1968), Jago (1968a, b; 1973), Kevan (1975) and Parihar (1971, 1972a, b) have worked on biology, ecology and distribution of this group.

Stal (1860, 1873a, b) was probably the first to initiate the study of Indian Acrididae. Walker (1870a, b; 1871) and Saussure (1884, 1888) also studied some Indian fauna. From 1990 onwards, Bolivar (1902, 1909, 1917, 1918a, b) made a major contribution to Indian fauna of Acrididae. A notable taxonomical work on Acrididae was made by Kirby (1914) in the series 'Fauna of British India'. Uvarov (1921a, b; 1924, 1927, 1942) studied in detail Indian Acrididae. Roonwal (1956 & 1976) contributed some studies on the nymphal structures and ecology on Acrididae. Bhowmik (1964, 1986), Tandon and Shishodia (1969-1989), Usmani and Shafee (1980-1990) have contributed works on the taxonomy of this group. Recently, Shishodia and Hazra (1986), Tandon & Hazra (1998) have done work on the taxonomy as well as on the ecology of this group. Other notable ecological and biological works on Acrididae from India include that of Katiyar (1956,57), Iqbal & Aziz (1974), Parihar (1974), Murlirangan & Ananthakrishnan (1977), Tandon & Khera (1978), Julka *et al.* (1982), Hazra *et al.* (1981, 1983, 1984, 1990, 1993, 1995, 2004) & Tandon (1988). Shrinivasan (1986a, b) has presented the zoogeography of grasshoppers from South India. Bhowmik (1964, 1984), Singh & Kevan (1965), Tandon *et al.* (1976), Bhowmik & Halder (1983, 1984), Usmani & Shafee (1980,1985) and Shishodia & Hazra (1986) have worked on the taxonomy of various genera and species from different parts of Indian region. Tandon & Shishodia (1989) have given a faunistic account of Acridoidea of Orissa. More recently taxonomic significance of Female genitalia of Indian Acridoidea has been studied by Khan and Usmani (2011) and male genitalia studied by Usmani and Khan (2012). Usmani & Khan (2010) reported fifty three species from various regions in North-eastern states of India, Akhtar *et al.*, (2012) reported twenty six species of grasshoppers from rice ecosystem of Uttar Pradesh, Usmani *et al.*,(2012) reported thirty four species of grasshoppers from pulses and paddy of Bihar and

Jharkhand. Nayeem and Usmani (2012) reported fourty one species of grasshoppers from Jharkhand and thirty seven species were reported from Bihar by Usmani and Nayeem (2012). Thirty three species of locusts and grasshoppers have been explored by Usmani *et al.*, (2010) from Western Uttar Pradesh and fourteen species from pulses Usmani *et al.*, (2012), twenty six species from Aligarh Fort of Uttar Pradesh, Usmani *et al.*, (2012) whereas ecological study of grasshopper fauna of Aligarh Fort has been done by Akhtar *et al.*, (2012), thirty two species of grasshoppers reported from Aligarh, Uttar Pradesh by Usmani *et al.*, (2012). Biology of *Acrida gigantea* has been done by Usmani *et al.*, (2012).

No survey work so far has been done exclusively for this group from North-Eastern region. There are very few reports on the taxonomy of Acrididae from North-Eastern States of India. Except for some sporadic reports there is no systematic study on the locusts and grasshoppers belonging to the family Acrididae from North-Eastern states in India, a hot spot of Biodiversity. Keeping in view the above fact, there is an urgent need to study the locust and grasshopper fauna of North-Eastern region of India and to begin with, the present work was aimed at studying one of the families of Acridoidea which is most widely distributed and show a very high degree of biological diversity.

Variation in fauna with natural habitat is common phenomenon in grasshoppers (Joyce, 1952; Uvarov, 1953; Roy, 1962; Phipps, 1968, 1970). Temperature, seasonal distribution of rain fall and soil conditions are some important factors which also determine the distribution of grasshoppers. The range of habitat diversity is exquisite in this group of insects. India provides an unique habitat for this group of insects. Maximum diversity of Acridid species was encountered in the typical tropical rain forest areas of North-Eastern states (Assam, Meghalaya) and Nilgiri, Wyned, Silent

valley areas of South India, and the tarai and dooars regions of the Himalayan foot hills. Acridid fauna of North-Eastern states in India have been so far neglected by entomologists. Keeping in view the economic importance of locusts and grasshoppers, comprehensive plan of collecting and identifying the Acrido-fauna of North-Eastern states of India including some observations on their distribution and diversity of these pests was undertaken. To explore the fauna thoroughly, North-Eastern states were surveyed in order to make a thorough investigation and to present a comprehensive picture of locusts and grasshopper fauna of this region.

The North-Eastern region in India constitutes of eight states, Arunachal Pradesh, Assam, Meghalaya, Sikkim, Manipur, Mizoram, Nagaland and Tripura. The south western monsoons are very active in this region of India and as a result, hot and moist conditions have contributed to occurrence of vast stretches of vegetation. It, however, still remains one of the least studied areas in faunistic studies and ecology. The Acridid distribution of this region has very rarely been studied.

An extensive and intensive survey to study the speciation and distribution of the locusts and grasshoppers belonging to the family Acrididae was undertaken in North-Eastern states of India. Systematic study of the material collected from various habitats and localities was made to understand the diversity in the group. Various important agricultural areas in different localities of this region were visited during 2008-2011 for survey of Acridid pests of agricultural crops. The survey yielded approximately 1,069 specimen from various sites of study in different states surveyed which served as a basis for the present critical study. This is the first systematic collection of locusts and grasshoppers from North-Eastern states. Some useful observations were also studied on their biology, pest-plant and plant-pest relationships.

Visualizing the economic importance of these pests in an agricultural country like India, and very less information available presently of Acridids of North-Eastern India, present study was planned. Extensive survey trips were made to North-Eastern regions including Assam, Arunachal Pradesh, Sikkim, Mizoram, Tripura, Meghalaya, Nagaland and Manipur. The survey yielded good number of species. Further, it has revealed interesting observations on the distribution of grasshopper species in different parts of North-Eastern India.

The present study is aimed at studying large number of species of Acrididae which were collected from different states of North-Eastern states of India. Their diversity and frequency of occurrence in different regions and habitat were calculated. The status of various characters used in the identification were judged on the basis of their consistency and variation to ascertain their importance in the group. The identification keys have been prepared to make identification easy.

The accurate identification of the pest is the essential basis for all investigations. Correct identification and knowledge on the biology are very essential for evaluation of damage caused by pests and also for developing suitable control measures. Knowledge on the biology, behavior of a pest is fundamental to an understanding of its ecology and population dynamics and to developing efficient control methods. Knowledge of the nature and causes of pest damage is also essential in order to suggest the appropriate amount of research and control efforts required. Experience has shown that control of agricultural pests is made easier when their taxonomy and biological observations have been placed on a sound basis.

Earlier literature on the systematic of Acridoidea is exclusively based on conventional characters, namely, shape, size, colouration, texture, number of antennal

segments etc. The recent trend in Acridid systematics is mainly based on genitalic characters especially of phallic complex. This has resulted into a profound change in the systematic concept of this group. The genitalic structures particularly epiphallus, aedeagus and spermatheca are less affected than the external characters by environmental conditions. A comparative study of these characters may therefore help to trace the interrelationship of the groups more clearly than the external characters.

The present study is based on the conventional as well as genitalic characters, for better understanding of the significance of morphological structures. Comparative study has been done on genitalia with reference to supra-anal plate and cerci (Plate 3H), subgenital plate (Plate 3F), epiphallus (Plate 3G), and aedeagus (Plate 3E) of males; subgenital plate (Plate 3A), supra-anal plate & cerci (Plate 3D), ovipositor (Plate 3B) and spermatheca (Plate 3C) of females. Shield or bridge-shaped condition of epiphallus; divided, undivided or flexured condition of aedeagus, presence or absence of gonopore process on aedeagus; presence or absence and tubular or sac-like condition of pre-apical diverticula of spermatheca; rudimentary or well developed condition of egg-guide are taken as stable characters for separating various families. Long or short condition of apical diverticulum of spermatheca, smooth or toothed condition of the apex of male cercus, presence or absence of ancorae on epiphallus, presence or absence of setae on posterior margin and Jannone's organs on female subgenital plate, slender or broad condition of ovipositor valves, long or short condition of valves of aedeagus are taken as stable characters for separating various subfamilies. Length of ovipositor valves in relation to lateral apodeme, shape and length of basal and apical valves of aedeagus, broad or narrow condition of bridge, mono, bi, and trilobate condition of lophi of epiphallus, shape of male supra-anal plate and subgenital plate, shape of posterior margin of female subgenital plate are suggested as useful generic characters.

Shape of male cercus, apical valve of aedeagus, shape and size of ancorae and female ovipositor valves, presence or absence of spines or tubercles on postero-ventral basivalvular sclerites of ovipiositor, shape of egg-guide of female subgenital plate, presence of protuberance on pre-apical diverticulum are taken as specific characters. These characters along with already recognized conventional characters have made the identification of families, subfamilies, genera and species more stable and practicable.

The separation of subfamilies is mainly based on the presence or absence of prosternal process, short or slender condition of apical and tubular or sac-like condition of pre-apical diverticula of spermatheca, plate or bridge-shaped condition of epiphallus, divided or undivided condition of epiphallus bridge, short or long condition of the valves of ovipositor, robust or slender condition of hind femur, open or closed condition of mesosternal interspace, rectangular or rounded condition of mesosternal lobes, presence or absence of spine on lower knee lobe of the hind femur, presence or absence of stridulatory serration on inner surface of the hind femur, presence or absence of intercalary vein on medial area of integument, vertical or oblique condition of frons.

In this study the author upholds recent workers in dividing the family Acrididae into subfamilies with a few generally accepted changes. At present the family Acrididae is known to contain 10 subfamilies represented by 42 genera from North-Eastern states in India. The genera and species recorded from this region are assigned under the following subfamilies, mainly based on conventional as well as genitalic characters. Family Acrididae: Subfamilies Eyprepocnemidinae, Catantopinae, Oxyinae, Spathosterninae, Tropidopolinae, Cyrtacanthacridinae, Coptacridinae, Acridinae, Oedipodinae and Gomphocerinae.

The terminology used for male genitalia is similar to that of Dirsh (1956). The terminology used for describing the female genitalia was that of Slifer (1939) and Agarwala (1952).

Review of Literature

Locusts and grasshoppers (Acridoidea) represent a special superfamily (or, in the opinion of some authors a suborder) of Orthoptera and have all the typical features of this order. Latreille (1802) for the first time proposed the family group name Acrididae based on genus Acrida Linnaeus (1758). Serville (1838) and Walker (1870a, b) independently proposed the family group names, Truxalidae and Oedipodidae respectively. Westwood (1840) used the family name Locustidae Leach and supressed Acrididae Latreille. Macleay in the Horae Entomologica recognized Acridina and Locustina as sections under Orthoptera. Burmeister (1840) proposed family group-name Pamphagidae based on the genus Pamphagus Thunberg (1815). Brunner Von Wattenwyl (1874) proposed the name Pyrgomorphinea based on the genus Pyrgomorpha Serville (1838). The family-group names: Poekiloceridae and Phymateidae proposed by Burmeister, 1840 have priority over Pyrgomorphiden. However, these were rejected and replaced by Pyrgomorphidae which has been accepted by all the recent workers in this field. Bolivar treated the group as tribe in 1884, family in 1902, 1904 and 1905 and subfamily in 1909.

Thomas (1880) retained the family name Acrididae and divided it into three subfamilies: Acridiinae, Tettiginae and Proscopiinae. Further, he divided the subfamily Acridiinae into three Tribes: Truxalini, Oedipodini and Acridini. Saussure (1884) recognized Oedipodii and Tryxalii as tribes of the family Oedipodidae.

Brunner (1893) recognized Acrydiinae, Eumastacmae, Tryxalinae, Pyrgomorphinae, Pamphaginae, Catantopinae, Pneumorinae and Proscopiinae as subfamilies of the family Acrididae. Later, this was followed by Kirby (1914).

Lefroy (1909) divided the family Acrididae into nine subfamilies: Tetriginae, Pneumoninae, Mastacinae, Proscopinae, Tryxalinae, Oedipodinae, Pyrgomorphinae, Pamphaginae and Acridinae.

Bolivar (1916) proposed subdivision of Pamphaginae into nine sections: Pamphagodes, Sygri, Nocarodes, Pamphagi, Akiceri, Fortheti, Adephagi, Finotii and Schinziae. Uvarov (1943) recognized nine tribes including six of Bolivar's group as tribes of Pamphaginae. Lucas (1920) raised the family Acrididae to the rank of sub-order Acridoidea. Further, he raised the subfamilies as recognized by Lefroy (1909) to the family status as Tetrigidae, Pneumoridae, Mastacidae, Proscopidae, Truxalidae, Oedipodidae, Pyrgomorphidae, Pamphagidae and Acrididae.

Uvarov (1921b) recognized Acridinae, Oedipodinae, Catantopinae and Pyrgomorphinae as subfamilies of the family Acrididae. In 1953 he added a fifth subfamily Pamphaginae to the family Acrididae. Further, he divided the subfamilies into tribes and groups as follows: Catantopinae (into nine groups: Catantopes, Coptacrae, Leptacres, Oxyae, Tristriae, Euthymiae, Euprepocnemi, Calliptami and Cyrtacanthacres), Acridinae (tribe Acridini into four groups: Gymnobothri, Phlaeobae, Pargae and Acridae; tribe Truxalini into three groups: Aulacobothri, Ochrilidae and Truxales); Pamphaginae (with one tribe: Porthetini). Uvarov in1966 gave an outline classification of the superfamily Acridoidea. He adopted Dirsh's (1961) system of classification but recognized Oedipodinae and Gomphocerinae as distinct subfamilies.

Zanon (1924) recognized the family Locustidae and divided it into five subfamilies: Truxalinae, Locustinae, Batrachotetriginae, Pamphaginae and Cyrtacanthacridinae.

Innes (1929) in his revison of Orthoptera of Egypt recognized the families Tettigidae, Acrididae (with one subfamily Acridinae), Oedipodidae, Eremobidae, Pyrgomorphidae, Pamphagidae, Catantopidae and Opomalidae. Chopard (1943) in his Orthopteroids of North-Africa considered Acridoidea as sub-order and divided it into two families: Acrydiidae and Acrididae. Further, he divided the family Acrididae into

six subfamilies: Acridinae, Oedipodinae, Batrachotetriginae, Pyrgomorphinae, Pamphaginae and Catantopinae. Willemse (1951) followed Lucas (1920) and gave distinct family status to Tetrigidae, Pneumoridae, Eumastacidae, Proscopiidae, Pyrgomorphidae, Pamphagidae, Omrnexechidae, Romaleidae, Catantopidae and Acrididae and assigned them under the superfamily Acridoidea. Further, he divided Acrididae into two subfamilies: Acridinae and Oedipodinae. In 1955 & 1957 he recognized Catantopinae as subfamily of Acrididae.

Bei-Bienko & Mishchenko (1951) divided the family Acrididae into six subfamilies: Acridinae, Oedipodinae, Catantopinae, Pyrgomorphinae, Pamphaginae and Egnatiinae, principally based on presence or absence of prosternal process, external apical spine of hind tibia, fastigial furrow, intercalary vein of tegmina, dark band on wing, filiform or ensiform condition of antennae, size of arolium between claws, oblique or vertical condition of frons. Later, this was followed by Mishchenko (1952). He further divided the subfamily Catantopinae into 18 tribes: Uvarovini. Dericorythini, Diexini, Iranellini, Tristriini, Hieroglyphini, Oxyini, Tropidopolini, Podismini, Cyrtacanthacridini, Conophymatini, Pezotettigini, Teratodini. Trauliini, Coptacrini, Catantopini, Calliptamini and Euprepocnemidini.

Rehn (1953) divided the family Acrididae into four subfamilies: Acridinae, Oedipodinae, Cyrtacanthacridinae (with three tribes: Oxyini, Spathosternini and Praxibulini), and Pyrgornorphinae (with five tribes: Chrotogonini, Atractornorphini, Desmopterini, Poekilocerini, and Psednurini).

Comstock (1954) termed the family Acrididae as Locustidae and divided it into three subfamilies: Oedipodinae, Truxalinae and Acrydiinae. Brues *et al.* (1954) followed Lucas (1920) in giving family status to Proscopiidae and Pneumoridae. They divided the family Acrididae into nine subfamilies: Acridinae, Oedipodinae,

Cyrtacanthacririae, Pyrgomorphinae, Pamphaginae, Eumastacinae, Psednurinae, Gamphomastacinae and Chorocetyphinac, principally based on the presence or absence of prostemal tubercle, length of antennae, shape of head, condition of femora etc. as important structures. Mason (1954) divided the family Acrididae into ten subfamilies: Pyrgomorphinae. Charilainae, Trigonopteryginae, Ommexechinae, Oedipodinae, Egnatiinae, Acridinae, Pauiiniinae, Catantopinae and Pamphaginae, based on the number of antennal segments. Johnston (1956) upholds Uvarov (1953) system of classification of Acridoidea. He gave the family status to Eumastacidae and Pneumoridae. Further, he divided the family Acrididae into eight subfamilies: Pamphaginae (with 8 tribes: Akicerini, Porthetini, Trachy, Schinziini, Adephagini, Thrinchini, Pamphagini and Finotiini), Pyrgomorphinae (with ten groups: Chrotogoni, Sphenarii, Dictyophori, Taphronotae, Phymatei, Poekiloceri, Pyrgomorphae, Atractomorphae, Orthacres and Geloii); Catantpoinae (with twenty-six groups: Dericorythes, Frontifissiae, Eremidii, Euthymiae, Leptacres, Hieroglyphi, Oxyrrhepes, Tropidopolae, Oxyae, Pezotettiges, Mazaeae, Coptacrae, Abisares, Acrostagastes, Apobolei, Serpusiae, Mesambriae, Allotriusiae, Allagae, Catantopes, Cyrtacanthacres, Eyprepocnemes, Euiyphymi, Devylderidae, Calliptami, Betiscoidi); Oedipodinae (with eight groups: Sphingonoti, Epacromii, Oedipodae, Trilophidiae, Acrotyiii, Locustae, Paracinemae, Calophori); Truxalinae (tribe Acridini with 5 gropus: Gynmobothri, Phlaeobae, Gelastorrhini. Pargae, Acridae and tribe Truxalini with 7 groups: Aulacobothri, Arcypterae, Erernogrylli, Tinariae, Chorthippi, Ochrilidiae, Truxales), Lethicerinae, Pamphagodinae and Egnatiinae. He did not make any attempt to divide the last three subfamilies into groups. In 1968 he considered Pamphagidae and Pyrgomorphidae as distinct families and divided the family Acrididae into 14 subfamilies: Dericorythinae, Rornalinae, Tropidopolinae, Oxyinae, Coptacridinae,

Calliptaminae, Euryphyminae, Eyprepocnemidinae, Catantopinae, Cyrtacanthacridinae, Egnatiinae, Acridinae, Eremogryllinae and Truxalinae.

Dirsh (1956a, b) recognized fourteen families of Acridoidea including Pyrgomorphidae, Pamphagidae and Acrididae as distinct families and divided the family Acrididae into 8 subfamilies: Ramaleinae, Catantopinae, Euryphyminae, Hemiacridinae, Acridinae, Egnatiinae, Eremogryllinae and Truxalinae. Further, he divided the subfamily Acridinae into 3 groups (Acridae, Pargi and Oedipodae) and Catantopinae into 13 groups (Cyrtacanthacres, Catantopes, Podisimae, Dericorythi, Apobolei, Serpusiae, Conophymae, Oxyrrhepes, Tropidopolae, Oxyae, Leptimae, Coptacrae and Euprepocnemes). His division of the subfamilies and groups was mainly based on the characters of the phallic complex. In 1961 he raised the number of subfamilies to sixteen by adding the subfamily Lathidiinae and also raising the groups: Cyrtacanthacres, Dericorythi, Tropidopolae, Oxyae, Leptacrae and Euprepocnemes to the rank of subfamilies: Cyrtacanthacridinae, Dericoiythinae, Tropidopolinae, Oxyinae, Coptacridinae and Eyprepocnemidinae respectively. In 1965 retained Acrididae, Pamphagidae and Pyrgomorphidae as distinct families and divided the family Acrididae into sixteen subfamilies: Dericorythinae, Romaleinae, Lithidiinae, Hemiacridinae, Tropidoplinae, Oxyinae, Coptacridinae, Calliptaminae, Euryphymrnae, Eyprepocnemidinae, Catantopinae, Cyrtacanthacridinae, Egnatiinae, Acridinae, Eremogryllinae and Truxalinae; Pamphagidae into four subfamilies: Pamphaginae, Akicerinae, Portethinae and Echinotropinae. He did not make any attempt to divide the family Pyrgomorphidae into subfamilies. This system was adopted by Johnsen and Forchhammer (1978). Later, in 1966 Dirsh erected the suborder Acridomorpha of the order Orthoptera and divided it into four superfamilies: Eumastacoidea, Trigonopterygoidea, Pneumoroidea and Acridoidea and it was followed in his later

work in 1968 and 1970. In 1973 he erected Eumastacidae to the order rank while other superfamilies of Acridomorpha were placed into a separate order Acridomorphoidea. Dirsh (1975) divided the order Acridomorphoidea (= Acridoidea) into three superfamilies: Pneumoroidea, Pamphagoidea with five families: Charilaidae, Lethiceridae. Ommexechidae, Pamphagidae (divided into four subfamilies: Akicennae, Echinotropinae, Pamphaginae and Portetinae) and Pyrgomorphidae (divided into thirteen subfamilies: Atractornorphinae, Chrotogoninae Desmopterinae, Dictyophorinae, Figipyrginae, Geloiinae, Nereniinae, Omurinae, Phymateinae, Psednurinae, Pyrgacrinae, Pyrgomorphinae and Zonocerinae) and Acridoidea with five families: Paulinidae, Lentulidae, Hemiacrididae (divided into eight subfamilies: Atacamacrinae, Chilacrinae, Conophyminae, Hemiacridinae, Leptahcrinae, Leptismlnae, Lithidiinae and Spathosterninae), Catantopidae (divided into twenty-three subfamilies: Anamesacrinae, Apoboleinae, Aucacnnae, Calliptaminae, Catantopinae, Coptacrinae, Cyrtacanthacrinae, Dericorythinae, Diexinae, Egnatiinae, Euryphyminae, Eyprepocneminae, Galideinae, Illapelinae, Opshomalinae, Oxyinae, Paraconophyminae, Pargainae, Podisminae, Romaleinae, Shelfordinae, Teratodmae and Tropidopolinae) and Acrididae (divided into 9 subfamilies; Acridinae, Eremogiyllinae, Gomphocerinae, Oedipodinae, Truxalinae, Chrysochraontinae, Gyrnnobothrinae, Hyalopteryxinae and Phlaeobinae).

Essig (1958) following Comstock (1954) in using the family name Locustidae and divided it into three subfamilies: Locustinae, Tryxalinae and Oedipodinae, mainly based on the presence or absence of prosternal tubercle, oblique or vertical condition of head as important characters. Shumakov (1963) in his Acridoidea of Afghanistan and Iran divided the family Acrididae into five subfamilies: Pamphaginae (with two tribes: Pamphagini and Thrinchini); Catantopinae (with fifteen tribes: Uvaroviini,

Dericorythini, Diexini, Iranellini, Conophymatini, Emiacridini, Hieroglyphii, Wiltshirallini, Oxyini, Tropidopolini, Teratodini, Cyrtacanthacridini, Catantopini, Calliptamini and Eprepocnemi); Acridinae (with Twelve tribes: Acridini, Ochrilidiini, Phlaeobini, Arcypterini, Mecostethini, Chorthippini, Aiolopini, Trilophidiini, Locustini, Oedipodini, Acrotylini and Sphingonotini); Pyrgomorphinae and Egnatiinae. Willemse (1965) recognized three families: Eumastacidae, Pyrgomorphidae and Acrididae of Acridoidea and divided the family Acrididae into seven subfamilies: Oxyinae, Hemiacridinae, Tropidopolinae, Coptacridinae, Catantopinae, Cyrtacanthacridinae and Acridinae. Avakyan (1968) divided the family Acrididae into five subfamilies: Catantopinae, Pyrgomorphinae. Acridinae, Pamphaginae and Oedipodinae.

Jago (1968b) recognized three families: Eumastacidae (with two subfamilies:. Chorotypinae and Euschmidtinae); Pyrgomorphidae and Acrididae (with seven subfamilies: Hemiacridinae, Tropidopolinae, Oxyinae, Coptacridinae Cyrtacanthacridmae, Eyprepocnemidinae and Truxalinae).

Kevan (1969, 1975), Kevan and Hsiung (1975), Eades and Kevan (1974), Kevan *et al.* (1970, 1971, 1972, 1974 & 1975) recognized Pyrgomorphidae as distinct family of Acridoidea and divided it into groups: ten series, thirty tribes and thirty subtribes in order to accomodate 143 genera. They separated the tribes on the basis of condition of body and integument, shape of head, presence or absence of median ocellus, flattened or cylindrical condition of antennae, condition of tegmina and hind wings, colouration of hind wings, shape of pronotum, presence or absence of prosternal tubercle, presence or absence of tympanum, condition of tarsal segments, shape of epiphalius, divided or undivided condition of aedeagal valves and shape of spermatheca.

Amedegnato (1974) recognized Acrididae and Romaleidae as distinct families and divided the family Acrididae into ten subfamilies: Acridinae, Oedipodinae, Gomphocerinae, Cyrtacanthacridinae, Melanoplinae, Proctolabinae, Copiocerinae, Leptysminae, Rhytidochrotinae and Ommatolampinae.

Harz (1975) recognized Acrididae, Catantopidae, Pyrgomorphidae and Pamphagidae as distinct families. Further, he divided the families into subfamilies and tribes as follows: Acrididae into four subfamilies: Egnatiinae, Acridinae (with two tribes: Acridini and Truxalini), Locustinae (with two tribes: Oedipodini and Vichetini) and Gomphocerinae (with two tribes: Gomphocerini and Chorthippinae); Catantopidae into six subfamilies: Catantopinae (with two tribes: Podismini and Pezotettigini), Calliptaminae, Eyprepocnemidinae, Cyrtacanthacridmae, Dericorythinae and Tropidopolinae; Pamphagidae into two subfamilies: Pamphaginae (with single tribe Pamphagini) and Akicerinae. He did not make any attempt to divide the family Pyrgomorphidae into subfamilies. He proposed the tribe Vichetini based on the name of a person, not on any type-genus.

Willemse and Kruseman (1976) in Orthopteroidea of Crete followed Dirsh (1975) system of classification of Acridomorphoid insects.

Mason (1979) in Acridoidea of south-west of Angola upholds Dirsh (1975) system of classification but she retained the superfamily name Acridoidea and recognized four families: Pyrgomorphidae (represented by four subfamilies: Taphronotinae, Pyrgomorphinae, Chrotogoninae and Atractomorphinae), Hemiacrididae (with two subfamilies: Spathosterninae and Leptacrinae), Catantopidae (represented by nine subfamilies: (Apoboleinae, Tropidopolinae, Coptacrinae, Calliptaminae, Euryphyminae, Eyprepocneminae, Cyrtacanthacrinae, Catantopinae and

Pargainae); and Acrididae (with six subfamilies: Gomphocerinae, Truxalinae, Oedipodinae, Acridinae, Gymnobothrinae and Phlaeobinae).

Llorente (1980) upholds Harz (1975) in the classification of Orthopteroids of Coto Donana (Huelva). He recognized Pamphagidae (with one subfamily Pamphaginae), Pyrgomorphidae, Catantopidae (with four subfamilies: Catantopinae, Calliptaminae, Eyprepocnemidinae and Cyrtacanthacridinae) and Acrididae (with three subfamilies: Acridinae, Locustinae and Gomphocerinae) as distinct families of Acridoidea. He did not make any attempt to divide the subfamilies into tribes.

Recently COPR (1982) classified and distributed locusts and grasshoppers of economic significance into following families and subfarnilies: Pamphagidae (divided into three subfamilies: Pamphaginae, Akicerinae and Porthetinae), Pyrgomorphidae, Tristridae, Pauliniidae, Ommexechidae, Lentulidae, Romaleidae (divided into two subfamilies: Romaleinae and Bactrophorinae) and Acrididae (divided into 19 subfamilies: Dericorythinae, Hemiacridinae, Proctoiabinae, Melanoplinae, Copiocerinae, Leptysminae, Ommatolampinae, Tropidopoiinae, Oxyinae, Coptacridinae, Calliptaminae, Eyprepocnemidinae, Catantopinae, Cyrtacanthacridinae, Acridinae, Oedipodinae, Gomphocerinae, Truxalinae and Conophyminae).

Johnsen (1982, 1987 & 1990) upholds Dirsh (1965) system of dividing the superfamily Acridoidea into families and subfamilies. He divided the family Acrididae into following subfamilies: Hemiacridinae, Tropidopolinae, Coptacridinae, Caliptaminae, Euryphyminae, Eyprepocnemidinae, Cyrtacanthacridinae, Acridinae, Truxalinae and Gomphocerinae. He followed the concept of Uvarov (1966) in treating the Truxalinae sensu Dirsh (1965) as two separate subfamilies: Truxalinae and Gomphocerinae.

Herrera and Schnidrig (1983) divided the suborder Caelifera into two superfamilies: Pamphagoidea with one family Pyrgomorphidae and Acridoidea with two families: Catantopidae (with two subfamilies: Catantopinae and Calliptaminae) and Acrididae (with two subfamilies: Oedipodinae and Gomphocerinae).

Gracia & Presa (1984) in Acridoidea of Sierra Espuna (Murcia, Spain) recognized four distinct families: Pamphagidae, Catantopidae, Pyrgomorphidae and Acrididae (with three subfamilies: Truxalinae, Locustinae and Gomphocerinae).

Clemente *et al.* (1987) in Orthopetra of Iberica followed Garcia & Presa (1984) in dividing the superfamily Acridoidea into four families: Parmphagidae (with two subfamilies: Akicerinae and Pamphaginae), Pyrgomorphidae, Catantopidae (with six subfamilies: Calliptaminae, Catantopinae, Cyrtacanthacridinae, Dericorythinae, Eyprepocnemidinae and Tropidopolinae) and Acrididae (with three subfamilies: Acridinae, Gornphocerinae and Locustinae).

Key (1986) classified Australian Acridoidea and recognized two distinct families: Pyrgomorphidae (with one subfamily Pyrgomorphinae) and Acrididae (with four subfamilies: Oxyinae, Catantopinae, Cyrtacanthacridinae and Acridinae).

Balderson & Yin (1987) in grasshoppers (Orthoptera) of Nepal divided the superfamily Acridoidea into four families: Chrotogonidae (with two subfamilies: Chrotogoninae and Tagastiriae), Pyrgomorphidae (With one family Atractomorphinae), Oedipodidae (with eight subfamilies: Spathoterninae, Catantopinae, Habrocneminae, Oxyinae, Oedipodinae, Locustinae, Ceracrinae and Arcypterinae) and Acrididae (with two subfamilies: Phlaeobinae and Acridinae).

Gomez *et al.* (1991) in Orthopetra of Albacete province (Spain) divided the superfamily Acridoidea into three distinct families: Pyrgomorphidae, Pamphagidae

(with two subfamilies: Akicerinae and Pamphaginae) and Acrididae (with five subfamilies: Catantopinae, Cyrtacanthacridinae, Acridinae, Oedipodinae and Gomphocerinae).

Herrera (1993) in Orthoptera of Navarra recognized two superfamilies under the suborder Caelifera: Tetrigoidea with one family Tetrigoidea and Acridoidea with two families: Catantopidae (with three superfamilies: Cyrtacanthacridinae, Catantopinae and Calliptaminae) and Acrididae (with three subfamilies: Oedipodinae, Acridinae and Gomphocerinae). This method was followed by Herrera & Larumbe (1996).

. Harz (1975) upholds Willemse (1951) in recognizing Pamphagidae, Pyrgomorphidae, Catantopidae and Acrididae as distinct families of Acridoidea, he further divided them (except Pyrgomorphidae) into subfamilies and tribes. Llorente (1980), Gracia & Presa (1984) and Clemente *et al.* (1987) followed Harz (1975) but did not make any attempt to divide the subfamilies into tribes. Dirsh (1975) recognized Pamphagoidea (including the families Pamphagidae and Pyrgomorphidae) and Acridoidea (including the families Catantopidae and Acrididae) as superfamilies of the order Acridomorphoidea and divided them into families and subfamilies. This was followed by Willemse & Kruseman (1976) and Herrera & Schnidrig (1983). Mason (1979) followed Dirsh (1975) in arranging the taxa but she retained the superfamily name Acridoidea.

The present author upholds recent workers in treating Acrididae as distinct family of the superfamily Acridoidea.

The system of classifying Acridoids by earlier workers was mainly based on easily recognizable externally visible characters, Slifer & King (1936), Slifer (1939,

1940 & 1943), Dirsh (1957a, b) and Meinodas *et al.* (1982) have shown the taxonomic significance of spermatheca in Acrididae.

Agarwala (1953) made a comparative study of ovipositor in various species of Acrididae and correlated the morphology of ovipositor with the oviposition sites. Mishchenko (1952) and Willemse (1968, 1977) gave brief descriptions and illustrations of ovipositor in some species of Acrididae. Usmani & Shafee (1983) have shown the taxonomic significance of ovipositor in some Indian species of Acrididae.

However, the taxonomic significance of female subgenital plate, supra-anal plate and cerci have not been shown. Willemse (1968, 1977) gave illustrations of female subgenital plate in a few species of Acrididae. Kevan *et al.* (1970, 1971, 1972, 1974 & 1975) illustrated female subgenital plate and recepticulum seminis in various genera of Pyrgomorphidae. Usmani & Shafee (1980) made a comparative study of female genitalia in some Indian species of Pyrgomorphinae.

Roberts (1941) made a comparative study of phallic complex and described three general forms of epiphallus; one distinctive for Pyrgomorphinae (now Pyrgomorphidae), one for Pamphaginae and its allied subfamilies (now Pamphagidae) and one for the remaining subfamilies of the Acrididae. Dirsh (1956b) made taxonomic studies on phallic complex in Acridoidea and made a comparative study of epiphallus in various families and subfamilies of Acridoidea and considered that there are only two principal forms, shield-like in Charilaidae and Pamphagidae and the other bridge-like in the remaining families of Acridoidea. Jago (1977) and Mishchenko (1986) gave illustrations of epiphallus in differentiating various species of the genus Ochrilidia. Ajaili and Usmani (1990) have shown the taxonomic significance of epiphallus in some Libyan species of Acridoidea.

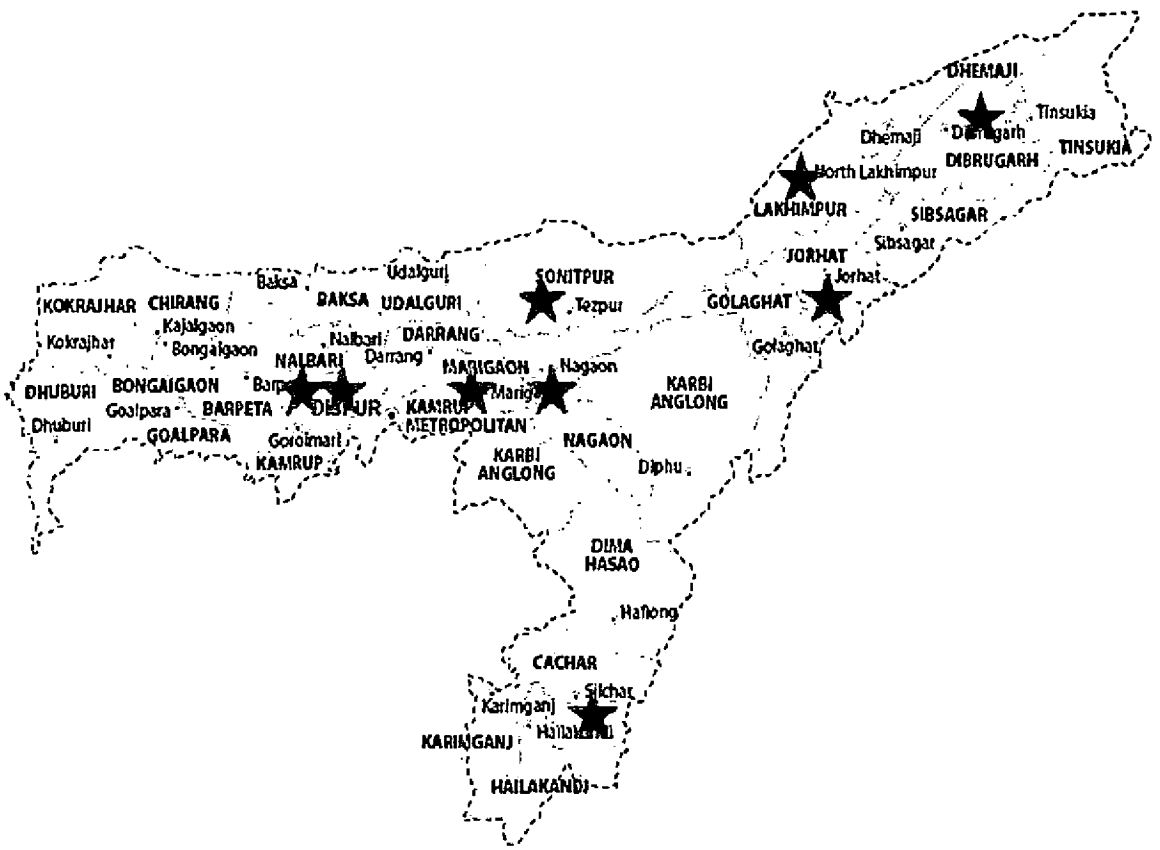
Dirsh & Uvarov (1953) studied the apical valve of penis (aedeagus) in three species of *Anacridium*. Dirsh (1956) has shown importance of aedeagus in classifying and grouping various families of Acridoidea. Usmani & Ajaili (1993) have shown taxonomic significance of aedeagus in some Libyan species of Acridoidea.

Herrera & Schnidrig (1983) described the male genetalia of 64 species of Orthoptera from Navarra. Khan & Usmani (2011) and Usmani and Khan (2012) made comparative study on female and male genitalia in some Indian species of Acrididae respectively.

Topography of the States of North-East India

During the survey of Acridid fauna from North-Eastern states of India, the specimens were collected from selected districts of eight states. The districts surveyed for collection have been marked with asterisk (★) in the map of states respectively.

ASSAM



Location and Geography

Assam, extending from 89^0 42' E to 96^0 E longitude and 24^0 8' N latitudes to 28^0 2' N latitudes in the graticule is a North-Eastern state of India. Assam is located at the central part of the North-East India and with an area of 78,438 km². It is almost equivalent to the size of Ireland or Austria.

Climate

With the 'Tropical Monsoon Rainforest Climate', Assam is a temperate region and experiences heavy rainfall and humidity. Winter lasts from late October to late February. The minimum temperature is 6 to 8 degrees Celsius. Nights and early mornings are foggy, and rain is scanty. Summer starts in mid May, accompanied by high humidity and rainfall. The maximum temperature is 35 to 38 degrees Celsius, but the frequent rain reduces this. The peak of the monsoons is during June. Thunderstorms known as *Bordoicila* are frequent during the afternoons. Spring and Autumn with moderate temperatures and modest rainfall are the most comfortable seasons. The climate is characterized by heavy monsoon downpours reducing summer temperatures and affecting foggy nights and mornings in winters. The region is prone to natural disasters with annual floods and frequent mild earthquakes.

Agriculture

Assam's economy is fundamentally based on agriculture. Over 70 percent of the state's population relies on agriculture as farmers, as agricultural laborers, or both for their livelihood. A majority of state's population, almost 90 percent of an estimated 22.4 million in 1991, live in rural areas where the mainstay of business is agriculture. In terms of the state domestic product (SDP), the agriculture sector contributed over 38 percent of the state income in 1990-91. Assam produces both food and cash crops. The principal food crops produced in the state are rice (paddy), maize (corn), pulses, potato, wheat, etc., while the principal cash crops are tea, jute, oilseeds, sugarcane, cotton, and tobacco. Although rice is the most important and staple crop of Assam, its productivity over the years has not increased while other crops have seen a slight rise in both productivity and land acreage. Tea is the most important cash crop in Assam and the state is well known

world-wide for its tea. The total land area under tea cultivation (gardens) was estimated at over 229,000 hectares in 1989, employing an average of over half-a-million people per day. In addition, a considerable number of Assam's population depends on secondary and tertiary sectors-related to the tea industry. Accounts for more than a third of Assam's income and employs 69% of workforce. Assam's biggest contribution to the world is tea. It produces some of the finest and expensive teas and has its own variety *Camellia assamica*. Assam also accounts for fair share of India's production of rice, rapeseed, mustard seed, jute, potato, sweet potato, banana, papaya, areca nut and turmeric. It is also a home of large varieties of citrus fruits, leaf vegetables, vegetables, useful grasses, herbs, spices, etc.

Demography

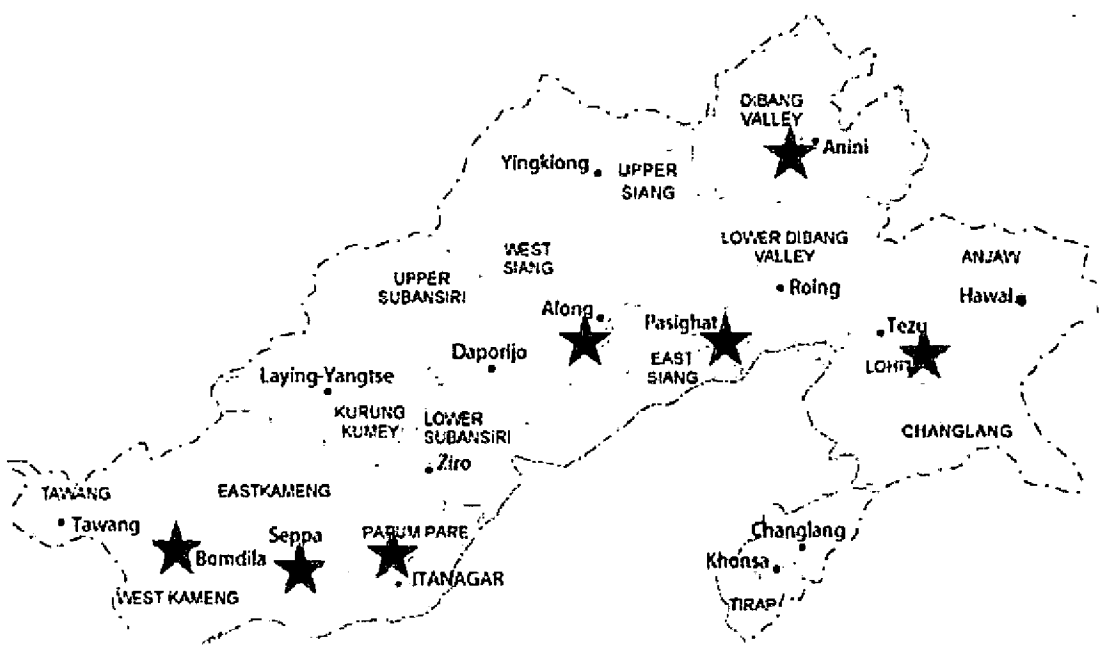
Assam is divided into 27 administrative districts. The districts are delineated on the basis of the features such as the rivers, hills, forests, etc. and majority of the newly constituted districts are sub-divisions of the earlier districts.

Assam is one of the richest biodiversity zones in the world and consists of tropical rainforests, deciduous forests, riverine grasslands, bamboo orchards and numerous wet ecosystems; Many are now protected as national parks and reserved forests. The Kaziranga, home of the rare Indian Rhinoceros, and Manas are two UNESCO World Heritage Sites in Assam. The state is the last refuge for numerous other endangered species such as the Golden Langur (Presbetis geei), White-winged Wood Duck or *Deohanh* (Cairina scutulata), Bengal Florican, Black-breasted Parrotbill, Pygmy Hog, Greater Adjutant and so on. Some other endangered species with significant population in Assam are the Tiger, Elephant, Hoolock Gibbon, Jerdon's Babbler and so on to name a few. Assam is also known for orchids. The Biodiversity of Assam, a state in North-East

India, makes it a biological hotspot with many rare and endemic plant and animal species.

Assam is endowed with petroleum, natural gas, coal, limestone and other minor minerals such as magnetic quartzite, kaolin, sillimanites, clay and feldspar. A small quantity of iron ore is available in western districts.

ARUNACHAL PRADESH



Location and Geography

Arunachal Pradesh is a federated state of India, located in the far North-East. It borders the states of Assam and Nagaland to the south and southeast, and shares borders with Burma in the east, Bhutan in the northwest, and the People's Republic of China in the north. Itanagar is the capital of the state.

Much of Arunachal Pradesh is covered by the Himalayas. However, parts of Lohit, Changlang and Tirap are covered by the Patkai hills. Kangto, Nyegi Kangsang, the main

Gorichen peak and the Eastern Gorichen peak are some of the highest peaks in this region of the Himalayas.

The Himalayan ranges that extend up to the eastern Arunachal separate it from Tibet. The ranges extend toward Nagaland, and form a boundary between India and Burma in Changlang and Tirap district, acting as a natural barrier called Patkai Bum Hills. They are low mountains compared to the Greater Himalayas.

Climate

The climate of Arunachal Pradesh varies with elevation. Areas that are at a very high elevation in the Upper Himalayas close to the Tibetan border enjoy an alpine or Tundra climate. Below the Upper Himalayas are the Middle Himalayas, where people experience a temperate climate. Areas at the sub-Himalayan and sea-level elevation generally experience humid, sub-tropical climate with hot summers and mild winters.

Arunachal Pradesh receives heavy rainfall of 80 to 160 inches (2,000 to 4,100 mm) annually, most of it between May and September. The mountain slopes and hills are covered with alpine, temperate, and subtropical forests of dwarf rhododendron, oak, pine, maple, fir, and juniper; sal (Shorea) and teak are the main economically valuable species.

Agriculture

Arunachal Pradesh with a massive 94% rural population, is the largest state in the North-East India. Consequently, the economy of the state is based of agriculture. Jhum cultivation and Terrace farming are the major patterns that the farmers employ to uplift agriculture in Arunachal Pradesh. In Jhum cultivation, lands are prepared by cutting

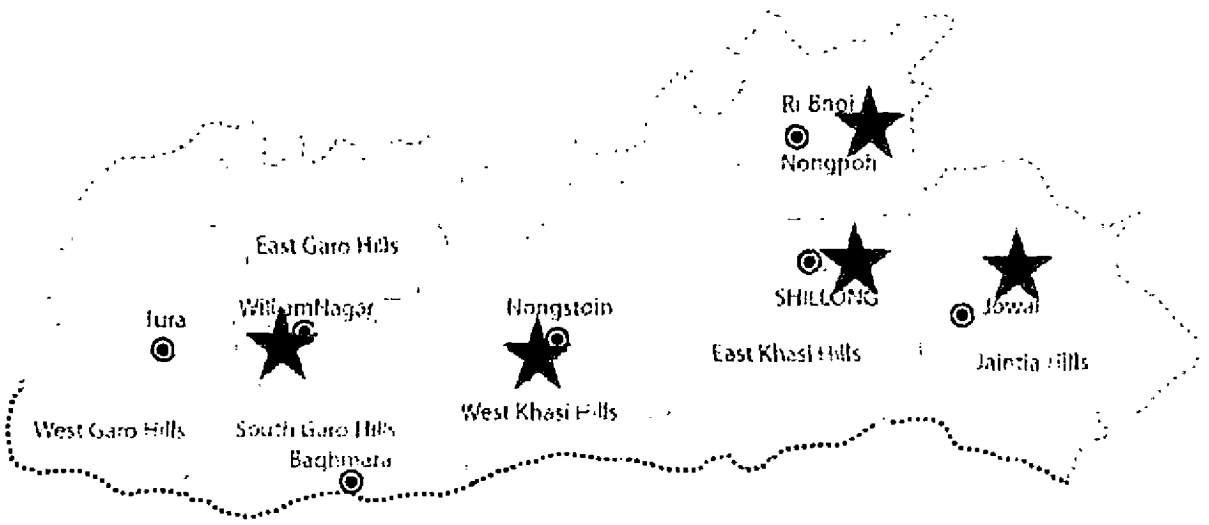
down or burning the unwanted cultivation, while in terrace farming hilly cultivated lands are shaped into multiple terraces to prevent soil erosion and quick runoff of water. Out of 83,74,200 hectares, agriculture in Arunachal Pradesh occupies only 1.10 lakh hectares under Jhum cultivation and 90 lakh hectares under permanent cultivation. The topography and climate of Arunachal Pradesh is conducive for the cultivation of rice, millet, wheat, pulses, sugarcane and potatoes.

The agro-climatic conditions also promote Horticulture in Arunachal Pradesh, producing tropical and sub-tropical fruits like Apple, Pineapple, Orange, Pear, Plums, Chestnut, Walnut, Guava, etc. Other major Horticultural products in Arunachal Pradesh are bamboo, spices, aromatic and medicinal plants, ginger, cardamom and mushroom.

Demography

Arunachal Pradesh located in North-Eastern India has fifteen districts and is called "Land of the Rising Sun". The literary meaning of the "Land of the Rising Sun" is "the land of the dawn lit mountains." The state has its capital in Itanagar, which is also its largest city. The state, known for its natural beauty is backed by a strong agricultural economy. It has a considerable amount of forest cover which ensures that the forest products also contribute to its economy. The tourism sector of the state, however, has not been fully utilized. Arunachal Pradesh extends from the snow covered Himalayas to the Brahmaputra plains. Lying at the country's north eastern tip, the state is surrounded by Tibet in the north and north east, Bhutan in the west and Assam and Nagaland in the south. The Himalayan range, besides the Himalayan foothills and Patkai hills, covers the majority of the state. The major rivers flowing through the state are Subansiri, Lohit, Siang, Kameng, and Tirap. These rivers are snow fed, originating from the Himalayas and splitting the state into five river valleys.

MEGHALAYA



Location and Geography

Meghalaya is a small state in North-Eastern India. The word "*Meghalaya*" literally means "The Abode of Clouds" in Sanskrit and other Indic languages. Meghalaya is a hilly strip in the eastern part of the country about 300 km long (east-west) and 100 km wide, with a total area of about 8,700 sq mi (22,720 km²). The population numbered 2,175,000 in 2000. The state is bounded on the north by Assam and by Bangladesh on the south. The capital is Shillong also known as the *Scotland of the East*, which has a population of 260,000. The elevation of the plateau ranges between 150 m to 1961 m. The central part of the plateau comprising the Khasi Hills has the highest elevations, followed by the eastern section comprising the Jaintia Hills Region. The highest point in Meghalaya is Shillong Peak, which is also a prominent IAF station in the Khasi Hills overlooking the city of Shillong. It has an altitude of 1961 m. The Garo Hills Region in the western section of the plateau is nearly plain. The highest point in the Garo hills is the Nokrek Peak with an altitude of 1515 m.

Climate

With average annual rainfall as high as 1200 cm in some areas, Meghalaya is the wettest place on earth. The western part of the plateau, comprising the Garo Hills Region with lower elevations, experiences high temperatures for most of the year. The Shillong area, with the highest elevations, experiences generally low temperatures. The maximum temperature in this region rarely goes beyond 28 degrees, whereas winters temperatures of sub-zero degrees are common. The town of Cherrapunji in the Khasi Hills south of capital Shillong holds the world record for most rain in a calendar month, while the village of Mawsynram, near the town of Cherrapunji, holds the distinction of seeing the heaviest yearly rains.

About one third of the state is forested. The Meghalaya subtropical forests ecoregion encompasses the state; its mountain forests are distinct from the lowland tropical forests to the north and south. The forests of Meghalaya are notable for their biodiversity of mammals, birds, and plants. Meghalaya, a hilly strip in eastern India, covers a total area of just 22,429 km^2. It was originally part of Assam, but on 21 January 1972, the districts of Khasi, Garo and Jaintia hills became the new state of Meghalaya.

Meghalaya is predominantly an agrarian economy. The important crops of the state are potato, rice, maize, pineapple, banana etc. The service sector comprises of Real estate and Insurance companies. Meghalaya's gross state domestic product for 2004 is estimated at $1.6 billion in current prices.

Agriculture

Meghalaya agriculture is the main contributor to the economy of this North-Eastern state of India. Around 80% of the total population of Meghalaya depends upon

agriculture for their living. Hence agriculture in Meghalaya is the main occupation of its people. Agriculture in Meghalaya has been flourishing due to the type of climate that it has throughout the year. Meghalaya do not receive evenly distributed rainfall. Hence the vegetation at every area differs. Some place have tropical vegetation while some have temperate vegetation. There has been a huge development in the agriculture sector in Meghalaya. In the last 25 years, the total cropped area has increased by about 42% out of which 60% comprises of the food grains. The use of the high yielding seeds of various varieties have given successful results thereby enhancing the agriculture at Meghalaya. The main food crops that are an essential part of agriculture around Meghalaya are rice and maize. Among the horticultural ones, pineapple, banana, lemon, Litchi, Jack fruits, plum, peach, Guava, Pear, etc, are the most important.

Nearly 10% of the total geographical area of Meghalaya is under cultivation. A substantial portion of the cultivated area is under the traditional shifting agriculture known locally as "Jhum" cultivation. Food grains are the most important crop in Meghalaya. These are grown in over 1,330 km², nearly 60% of the state's cultivated area. The production of food grains is over 230 thousand tonnes. Rice is the dominant food grain crop accounting for over 80% of the food grain production in the state.

Demography

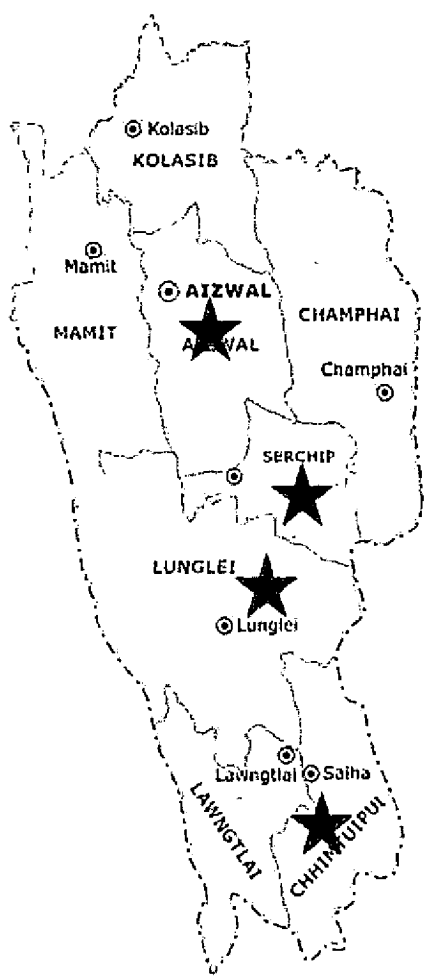
Shillong the capital of the state is a popular hill station. There are several falls in and around Shillong. The Shillong peak is highest in the state and is good for trekking. It is also known as the 'abode of the gods' and has excellent views. The State of Meghalaya is also known as the "Meghalaya Plateau". It consists mainly of archean rock formations. These rock formations contain rich deposits of valuable minerals like coal, limestone, uranium and sillimanite. Meghalaya has many rivers. Most of these are rainfed and are

therefore seasonal. The important rivers in the Garo Hills Region are Daring, Sanda, Bandra, Bhogai, Dareng, Simsang, Nitai and the Bhupai. In the central and eastern section of the plateau, the important rivers are Umkhri, Digaru, Umiam, Kynchiang (Jadukata), Mawpa, Umiew or Barapani, Myngot and Myntdu. In the southern Khasi Hills Region, these rivers have created deep gorges and several beautiful waterfalls.

Meghalaya currently has 7 districts. These are: East Garo Hills, East Khasi Hills, Jaintia Hills, Ri-Bhoi, South Garo Hills, West Garo Hills and the West Khasi Hills..

MIZORAM

Location and Geography



Mizoram means land of the Mizo people and it is one of the Seven Sister States in North-Eastern India, sharing borders with the states of Tripura, Assam, Manipur and with the neighbouring countries of Bangladesh and Myanmar. The capital of Mizoram is Aizawl.

Mizoram is a land of rolling hills, valleys, rivers and lakes. As many as 21 major hills ranges or peaks of different heights run through the length and breadth of the state, with plains scattered here and there. The average height of the hills to the west of the state are about 1,000 metres (3,281 feet). These gradually rise up to 1,300 metres (4,265 feet) to the east. Some areas, however, have higher ranges which go up to a height of over 2,000 metres (6,562 feet). Phawngpui Tlang also known as the

Blue Mountain, situated in the south-eastern part of the state, is the highest peak in Mizoram at 2,210 metres (7,251 feet).

The biggest river in Mizoram is Chhimtuipui, also known as Kaladan. It originates in Chin State in Burma and passes through Saiha and Lawngtlai districts in the Southern tip of Mizoram, goes back to Burma's Rakhine state, and finally enters the Bay of Bengal at Akyab, which is a very popular port in Sittwe, Burma. Although many more rivers and streams drain the hill ranges, the most important and useful rivers are the Tawng, Tut, Tuirial and Tuivawl which flow through the northern territory and eventually join the Barak River in Cachar District.

The Palak lake, the biggest in Mizoram is situated in Saiha District which is part of southern Mizoram covering 30 hectares (74 acres). It is believed that the lake was created as a result of an earthquake or a flood. The local people believe that a village which was submerged still remains intact deep under the waters. The Tamdil lake is a natural lake situated 85 km (53 mi) from Aizawl.

Climate

The agro-climatic conditions of Mizoram having both temperate and semi tropical climates with tropic and temperate zones, is conducive to a wide variety of crops. Mizoram has well-distributed rainfall of 1900 mm to 3000 mm (75 to 118 inches) spread over eight to ten months in the year and agriculture is the mainstay of the Mizos. More than 70% of the total population is engaged in some form of agriculture. The age-old practice of *Jhum* cultivation is conducted by most people living in rural areas. A low calorie sugar substitute, *Stevia rebaudiana*, known as 'sweetleaf', has also recently been grown to improve economical agricultural diversity.

Agriculture

Agriculture in Mizoram is the primary sector of the state's economy. Although the rugged terrains are not very conducive to the cultivation of crops, the even distribution of rainfall that varies between 1900 mm and 3000 mm and the fertile temperate soil facilitates extensive jhum cultivation. A number of crops like paddy, beans, cucumber, maize, arum, sesame, mustard and cotton are grown by practicing jhum or shifting cultivation. Paddy of course is the most important crop that is cultivated in the state of Mizoram. After the completion of the harvesting of paddy, the seeds of the other crops are inseminated in the ground. The sowing commences from the end of April, close to the occurrence of the full moon. The two types of paddy sown are the early paddy and principal paddy. The two crops are grown side by side in the same field. Although, the initial production of early paddy is poor, it ripens quickly and is a means of subsistence till the lush golden crop of principal paddy is gleaned. Besides agriculture, the cultivation of crops like sugarcane, cotton, tapioca, oilseeds, mustard, sesame, soybean and pulses like cowpea, French and rice beans also contribute towards the economy of Mizoram. Horticulture also adds substantially to the state's economy.

Demography

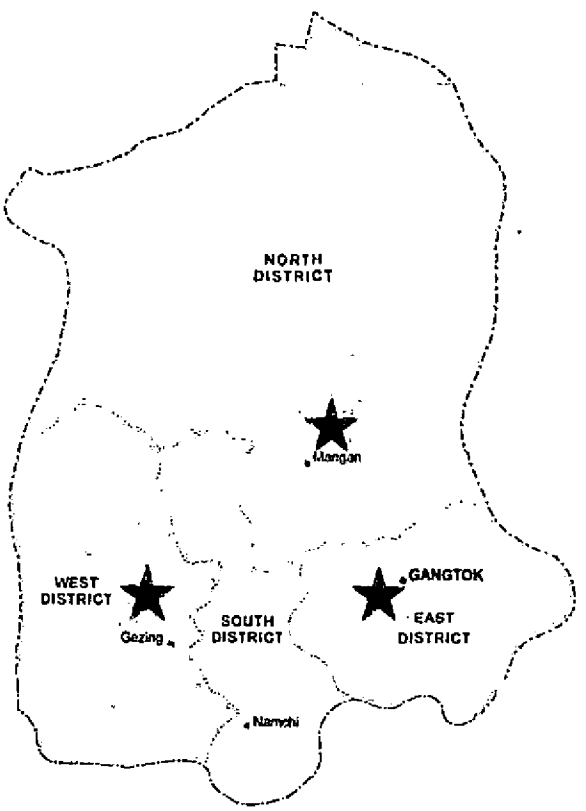
Mizoram is surrounded with conspicuous hills and mountain ranges. The tall green hills are moated with free flowing rivers. The eastern side of the state is situated at a higher altitude than the western side of the state. The average height of the Mizoram hills is approximately 900 meters. The tallest among the hills is the Phawngpui-Blue Mountain with a height of 2210 Meters. The picturesque valleys and flat lands of Cachar, Mat, Champhai, Chamdur and Tlabung are blessed with very fertile soil and natural

resources suitable for excellent agricultural and horticultural productions. The state is blessed with rich forest resources and beautiful lakes.

The rivers of Mizoram constitute a major part of its geography. Aided by heavy rainfall during the rainy seasons and occasional rainfall throughout the year, most of the Mizoram rivers are perennial in nature. Some of the rivers flowing through Mizoram are Tlawng or Dhaleshwari, Tiak, Teirei, Tuirini, Mat, Tuipui or Khawchhak, Tuivawl. The rivers of Mizoram are the main source of water for the people of the state. The perennial rivers of the state feed the lush green vegetation of Mizoram. The picturesque Lakes of Mizoram have emerged as popular tourism destinations of the state. Some of the important lakes in Mizoram are Palak Lake, Tamdil Lake, Rengdil Lake and Rungdil Lake.

SIKKIM

Location and Geography



Sikkim is a landlocked Indian state nestled in the Himalayas. It is the least populous state in India and the second-smallest state after Goa. This thumb-shaped state borders Nepal in the west, the Tibet Autonomous Region of the People's Republic of China to the north and the east and Bhutan in the southeast. The Indian state of West Bengal borders Sikkim to its south. Despite its small area of 7,096 km^2 (2,740 sq mi), Sikkim is geographically diverse due to its location in the Himalayas. The climate ranges

from subtropical to high alpine. Kangchenjunga, the world's third-highest peak, is located on the border of Sikkim with Nepal. Sikkim is a popular tourist destination owing to its culture, scenic beauty and biodiversity.

Climate

Sikkim's climate ranges from sub-tropical in the south to tundra in the northern parts. The tundra-type region in the north is clad by snow for four months every year, and the temperature drops below 0°C (32°F) almost every night. The peaks of north-western Sikkim are perpetually frozen. Most of the inhabited regions of Sikkim, however, experience a temperate climate, with the temperatures seldom exceeding 28°C (82°F) in summer or dropping below 0°C (32°F) in winter; the mean monthly summer temperature is 15°C. The state has five seasons: winter, summer, spring, autumn, and a monsoon season between June and September. The average annual temperature for most of Sikkim is around 18°C (64°F). Sikkim is one of the few states in India to receive regular snowfall. The snow line ranges from 20,000 feet in the north of the state to 16,000 feet in the south. During the monsoon, heavy rains increase the risk of landslides. The record for the longest period of continuous rain in Sikkim is 11 days. Fog affects many parts of the state during winter and the monsoons, making transportation perilous.

Agriculture

In Sikkim, agriculture is the main occupation of the inhabitants. Agriculture in Sikkim seems to be the basis of the socio-cultural pattern of the territory. In Sikkim, the aborigines of the land were nomads who spent their time hunting for food. But gradually, when the Bhutias came and settled in Sikkim they started practicing a semi-pastoral form of farming. The Bhutias practiced economy or sedentary farming within the territory of

Sikkim. It is only by the infiltration of the Nepali immigrants that agriculture started within the territory of Sikkim.

Sikkim is blessed by a fertile land that largely supports agriculture. The topography and the climatic condition of Sikkim is favorable for agriculture at Sikkim. Therefore, Sikkim witnesses a high yield every year. Among the chief crops grown in Sikkim are: Wheat, Paddy, Maize, Barley, Buck wheat, Cardamom, Potatoes and Tea, etc.

It is noteworthy that Sikkim produces the highest amount of Cardamom in India. Sikkim is also known for housing the largest area of Cardamom field within the territory. Cardamom is among the two cash crops of Sikkim, besides potato. Another important aspect of agriculture of Sikkim is tea. Sikkim is known for producing a special variety of tea that is known for its taste and quality throughout the world. One might come across a number of tea estates in Sikkim that form an integral part of Sikkim agriculture.

Demography

The thumb-shaped state is characterized by wholly mountainous terrain. Almost the entire state is hilly, with an elevation ranging from 280 metres (920 ft) to 8,585 metres (28,000 ft). The summit of the Kangchenjunga is the highest point which falls on the border between Sikkim and Nepal. For the most part, the land is unfit for agriculture because of the precipitous and rocky slopes. However, certain hill slopes have been converted into farm lands using terrace farming techniques. The Teesta, described as the "lifeline of Sikkim", flows through the state from north to south. About a third of the land is heavily forested.

The Himalayan ranges surround the northern, eastern and western borders of Sikkim in a crescent. The Lower Himalayas in the southern reaches of the state are the most densely populated. Sikkim's hot springs are known for medicinal and therapeutic

values. The most important hot springs are at Phurchachu (Reshi), Yumthang, Borang, Ralang, Taram-chu and Yumey Samdong. They have high sulphur content and are located near river banks. Some also emit hydrogen. The average temperature of the water in these hot springs is 50°C (122°F).

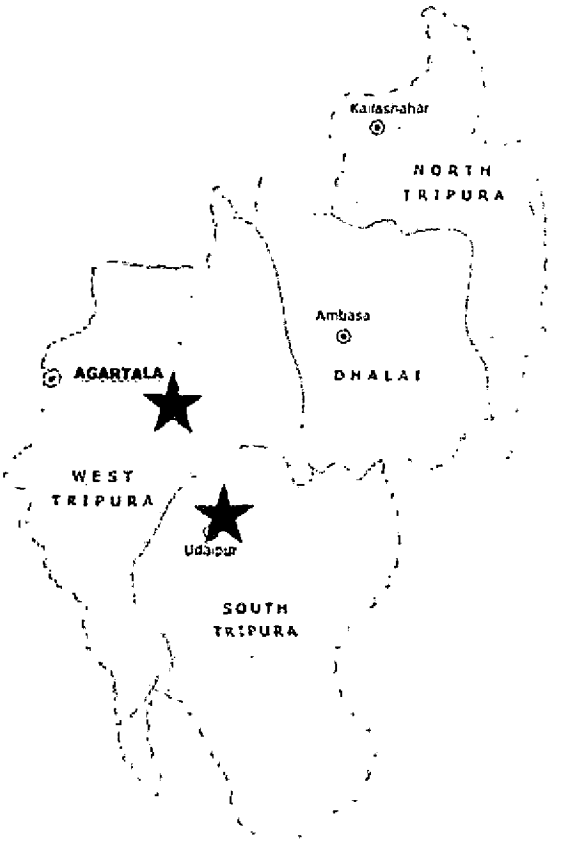
The hills of Sikkim mainly consist of gneissose and half-schistose rocks, making their soil brown clay, and generally poor and shallow. The soil is coarse, with large amounts of iron oxide concentrations, ranging from neutral to acidic and has poor organic and mineral nutrients. This type of soil tends to support evergreen and deciduous forests.

Sikkim is situated in an ecological hotspot of the lower Himalayas, one of only three among the Ecoregions of India. The forested regions of the state exhibit a diverse range of fauna and flora. The flora of Sikkim include the rhododendron, the state tree, with a wide range of species occurring from subtropical to alpine regions. In the temperate elevations above 1,500 metres (4,900 ft) are Eastern Himalayan broadleaf forests, where oaks, chestnuts, maples, birches, alders, and magnolias grow in large numbers, as well as Himalayan subtropical pine forests, dominated by Chir pine.

Sikkim has around 5,000 flowering plants, 515 rare orchids, 60 primula species, 36 rhododendron species, 11 oak varieties, 23 bamboo varieties, 16 conifer species, 362 types of ferns and ferns allies, 8 tree ferns, and over 424 medicinal plants. Sikkim also has a rich diversity of arthropods, many of which remain unstudied even today. As with the rest of India, the most studied group is that of the butterflies. Of approximately 1438 butterfly species found in the Indian subcontinent, 695 have been recorded from Sikkim.

TRIPURA

Location and Geography



Tripura is a state in North-East India, with an area of 4,051 sq. mi. or 10,491.69 km². Tripura is surrounded by Bangladesh on the north, south, and west. The Indian states of Assam and Mizoram lie to the east. The capital is Agartala and the main languages spoken are Bengali and Kokborok. Tripura is a landlocked hilly state in North-Eastern India with altitudes varying from 15 to 940 m above sea level, though the majority of the population lives in the plains. Tripura has a tropical climate and receives rainfall during the monsoons. It is surrounded on the north, west, and south by Bangladesh and is accessible to the rest of India through the Karimganj district of Assam and Aizawl district of Mizoram in the east. The state extends between 22°56'N and 24°32'N and 90°09'E and 92°10'E. Its maximum stretch measures about 184 km (114 mi) from north to south and 113 km (70 mi) from east to west with an area of 10,491.69 km². Tripura is the third smallest state of the country. Although landlocked, Tripura has many rivers including the Manu River which originates here. The state is located in the bio-geographic zone of 9B-North-East Hills and possesses an extremely rich bio-diversity.

Climate

The state is overall subject to a tropical savanna climate that is designated under the Köppen climate classification, although the undulating topography lead to local variations particularly in the hill ranges. The four main seasons are as follows—Winter (December–February), Pre-monsoon or Summer (March–April), Monsoon (May–September) and Post Monsoon (October–November). The southwest monsoon brings heavy rains during the monsoon season. According to data from 1977–2008, the average annual rainfall of the state is 2,196.4 mm (86.47 in). Generally, the maximum and minimum temperatures during Winter (December–January) are around 27°C (81°F) and 13°C (55°F), and during Summer (March–April) are 36°C (97°F) and 24°C (75 °F) respectively.

Agriculture

Agriculture of Tripura mainly comprises of horticulture products. Blessed with a salubrious climate and an average rainfall of 2500 mm, Tripura produces several delicious fruits that add to the economic strength of the state. The warm and humid climatic condition of Tripura is perfect for producing plenty of fruits, spices and vegetables. Rubber and tea are also produced in some parts of Tripura. Agriculture is the backbone of the economy of Tripura. Most of the indigenous local inhabitants of the state are engaged in the traditional occupation of cultivating fruits, and vegetables. Some of the important agricultural productions of the state of Tripura are: Jackfruit, Orange, Pineapple, Banana, Mango, Litchi, Lemon, Kharif Vegetables, Potato, Rabi Vegetables, Cashewnut, Coconut, Areca-nut, Turmeric, Ginger, Chilly.

The farmers of the state practice organic cultivation of fruits, vegetables and spices. Most of the cultivators follow traditional methods of producing crops. The state

government of Tripura has taken special steps to improve the agricultural growth of the region. The well maintained network of markets helps in the easy marketing of the agricultural products. The juicy and delicious fruits of Tripura are exported to other countries that enable the state to earn revenues and hence build a strong economic base. Tripura has several small fruit processing centers that produce numerous products from the fruits of the state. Agriculture is one of the main sources of earning income for the rural inhabitants of Tripura.

Demography

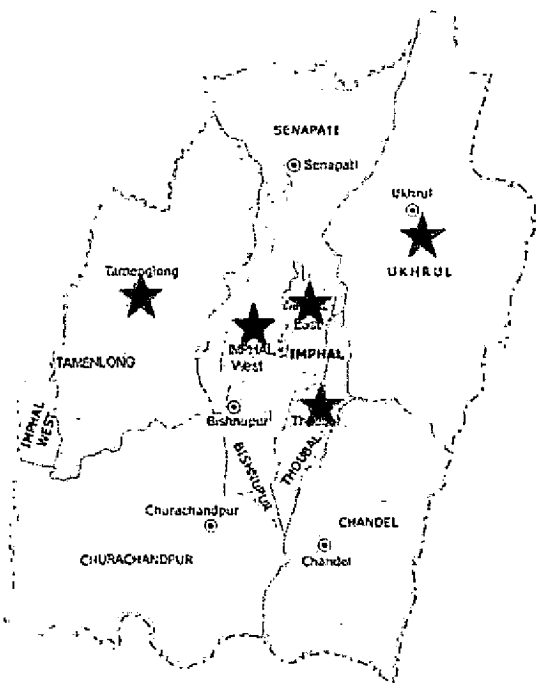
The local flora and faunal components of Indo-Malayan and Indo-Chinese sub-regions. There are 379 species of trees, 320 shrubs, 581 herbs, 165 climbers, 16-climbing shrubs, 35 ferns, and 45 epiphytes. Wildlife sanctuaries of the state include Sipahijola Wildlife Sanctuary, Gumti Wildlife sanctuary, Roa Wildlife Sanctuary, and Trishna Wildlife Sanctuary. National parks of the state in Clouded Leopard National Park, Sepahijola, and Rajbari National Park, Trishna. Major towns of the state are Agartala, Bishalgarh, Jogendranagar, Sonamura, Amarpur, Dharmanagar, Pratapgarh, Udaipur, Kailashahar, Teliamura, Indranagar, Khowai, and Belonia. Badharghat, Jogendranagar, and Indranagar are now parts of the Agartala municipality.

MANIPUR

Location and Geography

Manipur is one of the seven states of North-East India, and one of the Seven Sister States. The state is bounded by Nagaland in the north, by Mizoram in the south, by Assam in the west, and by the borders of the country Burma in the east as well as in the south. The state capital of Manipur is Imphal. The state lies at latitude of 23°83'N –

25°68'N and longitude of 93°03'E – 94°78'E. The total area covered by the state is 22,347 km². The capital lies in an oval-shaped valley of approximately 700 square miles (2,000 km²) surrounded by blue mountains and is at an elevation of 790 metres above the sea level. The slope of the valley is from north to south. Manipur may be characterised in two distinct physical regions – an outlying area of rugged hills and narrow valleys, and the inner area of flat plain, with all associated land forms. These two areas are not only distinct in respect of physical features but are also conspicuous with regard to various flora and fauna. The valley region would have been a monotonous, featureless plain but for a number of hills and mounds rising above the flat surface. The Loktak lake is an important feature of the central plain. The total area occupied by all the lakes is about 600 km². The altitude ranges from 40 m at Jiribam to 2,994 m at Mt. Iso Peak near Mao Songsong.



Climate

The climate of Manipur is largely influenced by the topography of this hilly region which defines the geography of Manipur. Lying 790 meters above sea level, Manipur is wedged between hills on all sides. This North-Eastern corner of India enjoys a generally amiable climate, though the winters can be a little chilly. The temperature ranges from sub-zero to 36°C. In winter the temperature often falls below zero, bringing frost. Snow

sometimes falls in some hilly regions due to the Western disturbance. The average annual rainfall of the State varying from 933 mm at Imphal to 2593 mm at Tamenglong.

Agriculture

Agriculture in Manipur is one of the principal sources of revenue in the state and plays a pioneering role in strengthening the state's fiscal backbone. Manipur, one of the elite members of the seven sisters whose agglomeration forms North-Eastern India, is striving to boost its economy. Although, the net cropped area accounts for about 9.41% of the state's total area, agriculture is the main mean of economic subsistence of over 76% of the workforce. It is interesting to note that 52% of the total agricultural area lies in the valley and is responsible for the livelihood of more than half the populace of Manipur valley. Paddy is the principal crop that is cultivated. The quintessential Manipuri Rice is famed all over the country for its sweet flavor and aromatic fragrance. This sweet rice can be consumed wholly on its own, without any additional gravy or curry. Apart from rice, wheat, maize and pulses, fruits and vegetables are also grown aplenty. Punghul and relocating and transplanting seeds are the primary modes of cultivation that are practiced in the state. Jhum and terrace cultivation is extensively practiced in the hilly areas. The land is usually cleared during the months of January and February and couple months later, during the summer months of April, May and June the seeds are planted. Finally harvesting commences in October and culminates in early December. The soil and climatic conditions are also conducive to the growth of all sorts of crops.

Demography

The soil cover can be divided into two broad types, viz. the red ferruginous soil in the hill area and the alluvium in the valley. The valley soils generally contain loam, small rock fragments, sand and sandy clay, and are quite varied. On the plains, especially flood plains and deltas, the soil is quite thick. The top soil on the steep slopes is very thin. Soil on the steep hill slopes is subject to high erosion, resulting in gullies and barren rock slopes. The normal pH value ranges from 5.4 to 6.8.

NAGALAND

Location and Geography

Nagaland is a state in the far North-Eastern part of India. It borders the state of Assam to the west, Arunachal Pradesh and part of Assam to the north, Burma to the east and Manipur to the south. The state capital is Kohima, and the largest city is Dimapur. The state of Nagaland has an area of 16,579 km^2 with a population of 19,80,602 (nineteen lakhs eighty thousand six hundred two) as per the 2011 census making it one of the smallest states of India. The state is mostly mountainous except those areas bordering Assam valley. Mount Saramati is the highest peak in Nagaland with a height of 3,840 metres and its range forms a natural barrier between Nagaland and Burma. It lies between the parallels

of 98 degree and 96 degree East Longitude and 26.6 degree and 27.4 degree latitude North of the Equator. Nagaland is largely a mountainous state. The Naga Hills rise from the Brahmaputra Valley in Assam to about 2,000 feet (610 m) and rise further to the southeast, as high as 6,000 feet (1,800 m). Mount Saramati at an elevation of 12,552 feet (3,826 m) is the state's highest peak; this is where the Naga Hills merge with the Patkai Range in Burma. Rivers such as the Doyang and Diphu to the north, the Barak river in the southwest and the Chindwin river of Burma in the southeast, dissect the entire state. 20 percent of the total land area of the state is covered with wooded forest, rich in flora and fauna. The evergreen tropical and the sub tropical forests are found in strategic pockets in the state.

Climate

Nagaland has a largely monsoon climate with high humidity levels. Annual rainfall averages around 70–100 inches (1,800–2,500 mm), concentrated in the months of May to September. Temperatures range from 70°F (21°C) to 104°F (40°C). In winter, temperatures do not generally drop below 39°F (4°C), but frost is common at high elevations. The state enjoys a salubrious climate. Summer is the shortest season in the state that lasts for only a few months. The temperature during the summer season remains between 16°C (61°F) to 31°C (88°F). Winter makes an early arrival and bitter cold and dry weather strikes certain regions of the state. The maximum average temperature recorded in the winter season is 24°C (75°F). Strong north west winds blow across the state during the months of February and March.

Agriculture

Agriculture in Nagaland is considered a prime source of revenue for the state. Economy of Nagaland gets a major boost through the agricultural activities of the state. Terrace and jhum cultivation are widely practiced by the tribal communities of Nagaland. The crops that have a high yield in the state of Nagaland include rice, tobacco, oilseeds, pulses, fibers, potato and sugarcane. The local people of Nagaland earn their living by growing a number of crops in their fields. One of the major reasons behind the flourishing agricultural economy of Nagaland is the developed state of irrigation in the place. The water channels that are controlled by bamboo sticks provide unhindered irrigation facilities to the crop fields of Nagaland. Apart from major crops the farmers of Nagaland also produce plantation crops like coffee, tea and cardamom. Potato and sugarcane are the two prime cash crops that generate revenue for the Nagaland economy. Then there are many vegetables that are grown by the peasants of Nagaland like that of carrots, chillies, onion, melon, spinach leaf, cucumber, brinjal, tomatoes and mustard. Sugarcane, maize, yams, potato, millet and arums are considered as the principal crops of Nagaland state. The farmers of Nagaland grow their crops on the basis of the rain conditions in the place. Having an agri-climatic condition Nagaland is known to have high yield.

Demography

The population of Nagaland is nearly two million people. The population mostly consists of Agriculturalist and around 75% of the population live in the rural areas. The state of Nagaland is drained by four chief rivers of Doyang, Jhanji, Dhansiri and Dikhu. The rivers are the tributaries of the mighty Brahmaputra River with their sources in the mountain ranges of the state. The rich alluvial deposit of the rivers facilitates crop

cultivation in the state. 20 percent of the total land area of the state is covered with wooded forest, rich in flora and fauna. The evergreen tropical and the sub tropical forests are found in strategic pockets in the state of Nagaland. The economy of the state of Nagaland benefits from the rich minerals which are found in abundance in the state. Iron, limestone, cobalt, coal, nickel and chromium are found in the state of Nagaland.

Materials and Methods

Fresh material of adult grasshoppers of both sexes from various localities and regions of North-Eastern states was brought to laboratory which served the basis for the present critical study. A complete record was also maintained indicating the reference number, locality, data of collection and name of host plants etc.

I) Collection of adult grasshoppers

Various agricultural areas of North-Eastern states were visited during the period 2008-2011 for the collection of grasshoppers and locusts. They were caught by hands, by forceps, and by the ordinary aerial insect net. The net was used for catching insects individually or by sweeping on grasses, bushes and other vegetables. Since some Acridids live on trees, it is sometimes highly rewarding to investigate the branches of trees. Attempts were made to collect the specimens from their host plants as well as those attracted to light during the night. They were captured on different dates in different months from various crops. Different parts of crops were examined. Attention was also given to fruits and vegetables. The collected specimens were killed in ethyl acetate bottles.

II) Preparations for morphological studies

Dry mounts were also prepared for better understanding of certain characters like size, colour, texture etc. For this purpose, the specimens were first relaxed, stretched and later, they were pinned and labelled. Permanent collections of pinned specimens were kept in store boxes and cabinets for further studies on their morphological structures.

III) Preparations for genitalia studies

For a detailed study of the various components of genitalia, the apical part of male and female bodies were cut off and boiled in 10% potassium hydroxide for a variable period till the material became transparent (usually about 10 minutes) to

remove unsclerotized and non-chitinous tissues. They were then thoroughly washed in tap water for complete removal of KOH and examined in 70 percent ethyl alcohol on a cavity slide. Later, every specimen was dissected under a binocular microscope with the help of fine needles to separate various components viz., supra-anal plate and cerci, subgenital plate, epiphallus and aedeagus of male, supra-anal plate and cerci, subgenital plate, ovipositor and spermatheca of female. The normal process of dehydration was adopted and clearing was done in clove oil. The genital structures were mounted separately on cavity slides in Canada balsam. A 22 mm square cover-glass over the cavity of the slide was normally used when examining the supra-anal plate and subgenital plate. This was made to prevent them from curling upwards and inwards at the edges. The ovipositor was mounted in canada balsam on another cavity slide oriented to the required position without cover glass. The slides were kept in a slide drier at a temperature of approximately 40°C for about one week to get them completely dry.

The permanent slides were examined under the microscope in order to make a detailed study of the genital structures.

Drawings were initially made with the help of a camera lucida. Details were filled in by conventional microscope examination.

IV) Data analysis

The diversity of individuals present in an ecosystem can be used as one gauge of the health of an ecosystem. Comparison of the diversity index with that of other areas provides insights into the diversity and the health of the ecosystem. Shannon's diversity and Margelef's diversity index was used for analysis of data.

i.) Shannon's diversity index: $H' = -\sum_{i=1}^{R} p_i \ln p_i$

where, H' = The Shannon Diversity Index

R = total number of species

pi = ni/N= relative abundance of species "i"

ni = number of individuals of species "i"

N = total number of individuals of all species

ii.) Margalef's diversity index: d = S −1 log N

where, d = Margalef's diversity index

S = Total number of species,

N = Total number of individuals.

Taxonomic Account

FAMILY ACRIDIDAE MacLeay, 1821

Acrididae, MacLeay. 1821. *Horae entomologicae: or essays on the annulose animals.* Bagster, vol. 1, part. 2, p. 161-524.

Type-genus : *Acrida* Linnaeus, 1758.

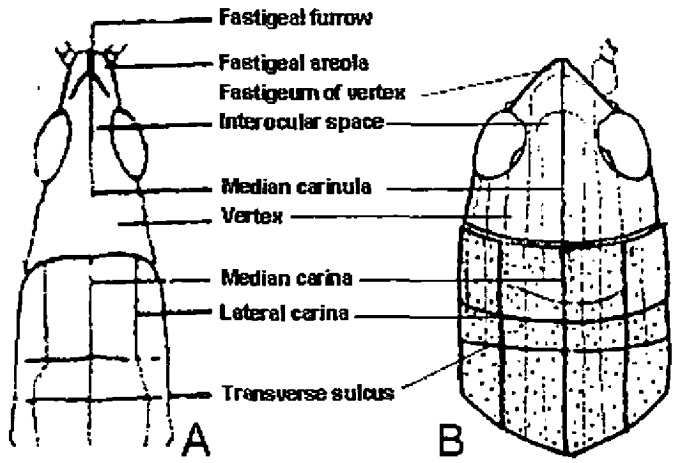
Diagnosis: Body and head of variable shape; fastigial furrow absent; frons vertical or oblique; frontal ridge wide, often with median depression; antennae longer than fore-femora; pronotum short, with or without median and lateral carinae; prosternal process present or absent; tegmina and wings fully developed, reduced or absent; tympanum usually present; stridulatory mechanism of variable structure, present or absent; lower basal lobe of hind femur shorter than or as long as upper one; tarsai 3-segmented; arolium between claws present; epiphallus usually bridge-shaped, rarely disc shaped, ancorae and lophi present, sometimes absent; aedeagus with basal and apical valves connected by a flexure, sometimes divided, gonopore process present; spermatheca usually with apical and pre-apical diverticula.

The family Acrididae is represented by ten subfamilies from North-Eastern region. A key for their separation is given below:

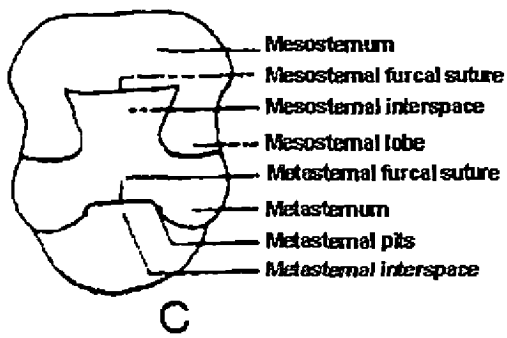
KEY TO SUBFAMILIES OF ACRIDIDAE MacLeay, 1821

1. Prosternal process absent 2

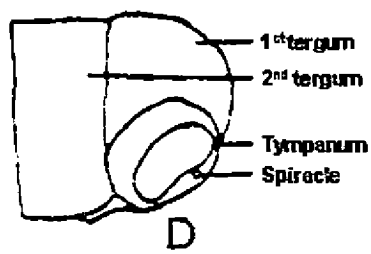
--- Prosternal process present 4



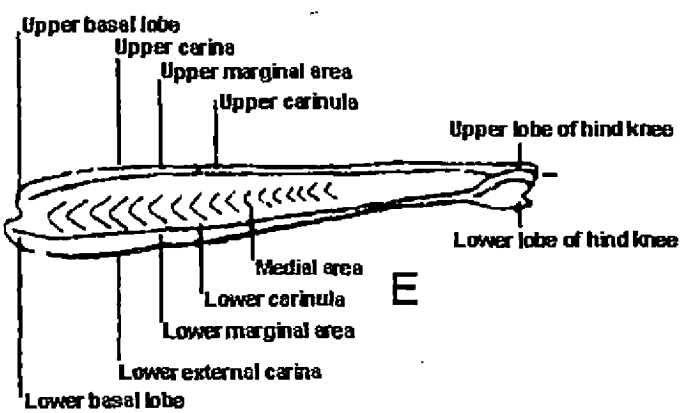
HEAD AND PRONOTUM IN DORSAL VIEW



MESO- AND METASTERNUM

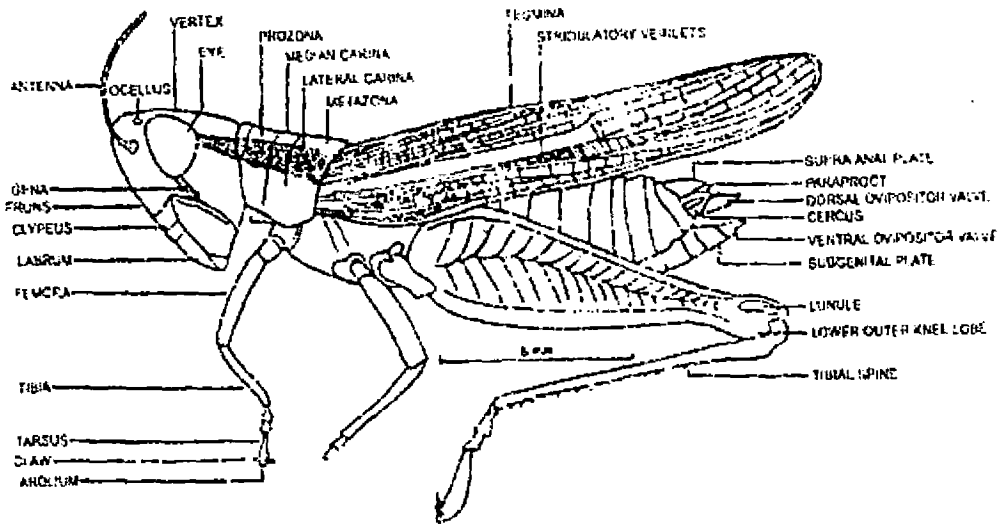


BASE OF ABDOMEN, LATERAL VIEW

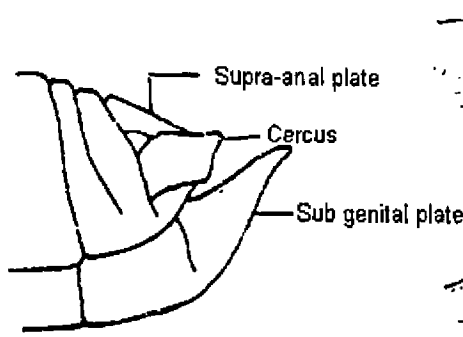


HIND FEMUR

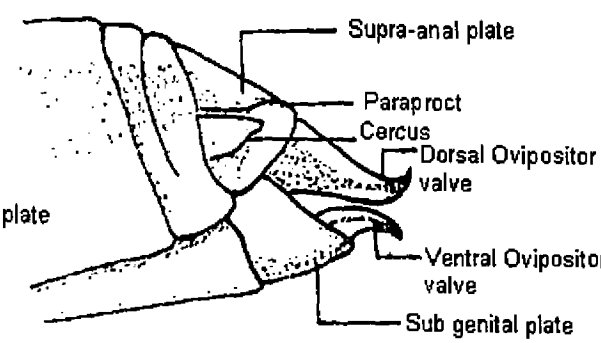
PLATE 1



Spathosternum prasiniferum (Walker)

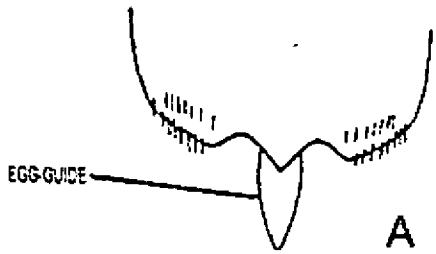


Lateral view of abdominal end of male

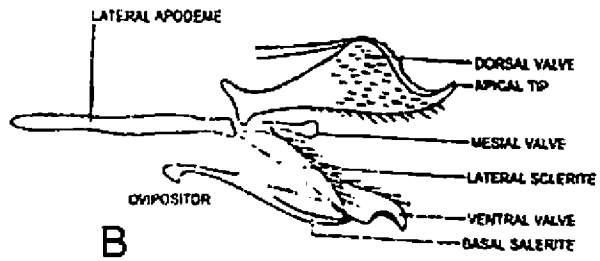


Lateral view of abdominal end of female

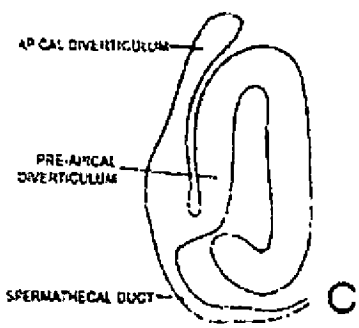
PLATE 2



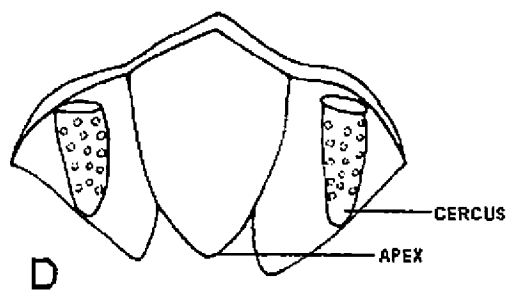
FEMALE SUBGENITAL PLATE



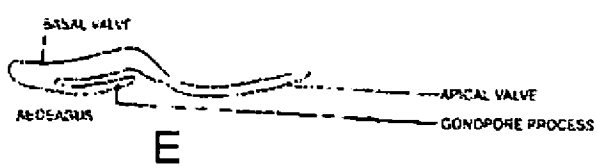
OVIPOSITOR



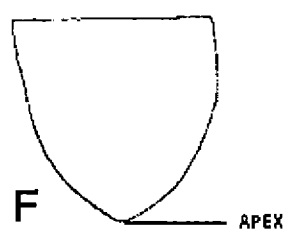
APICAL PART OF SPERMATHECA



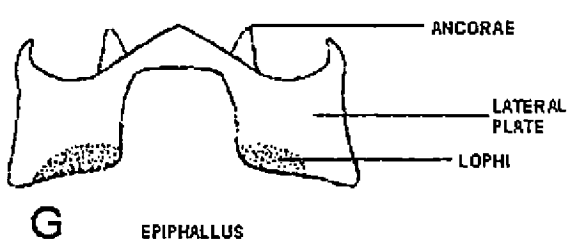
FEMALE SUPRA-ANAL PLATE



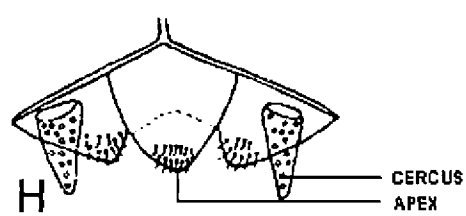
AEDEAGUS



MALE SUBGENITAL PLATE



EPIPHALLUS



MALE SUPRA-ANAL PLATE

PLATE 3

2. Stridulatory serration on inner side of hind femur absent 3

--- Stridulatory serration on inner side of hind femur present; its stridulatory file with a series of articulated pegs ..... **Gomphocerinae** Fieber, 1853

3. Body usually slender; frons oblique; pronotum usually with lateral carinae; medial area of tegmen usually without intercalary vein, if present, never serrated in both sexes ..... **Acridinae** MacLeay, 1821

--- Body rather sturdy; frons usually vertical; pronotum usually without lateral carinae; medial area of tegmina with intercalary vein usually serrated .... **Oedipodinae** Walker, 1871

4. Lower knee-lobe of hind femur never spined; valves of ovipositor usually never serrate or spined; hind tibia never flattened 5

--- Lower knee-lobe of hind femur spined; valves of ovipositor serrate or spined; hind tibia usually flattened .....**Oxyinae** Brunner, 1893

5. Radial area of tegmen without transverse stridulatory veinlets; valves of aedeagus flexured; aroilum of variable size 6

--- Radial area of tegmen with a series of regular, parallel, thickened, transverse stridulatory veinlets; valves of aedeagus divided or connected by small or indistinct flexure; arolium large ..... **Spathosterninae** Rehn, 1957

6. Mesosternal interspace open; hind femur with dorsal carina finely denticulate, sometimes smooth; external apical spine of hind tibia usually absent..... 7

--- Mesosternal interspace closed; hind femur with dorsal carina smooth; external apical spine of hind tibia present ..... **Tropidopolinae** Jacobson, 1905

7. Mesosternal lobes rounded; ancorae well developed and curved; pronotum with median carina never raised; spermatheca with apical divertioculum moderately long 8

--- Mesosternal lobes rectangular; ancorae small or indistinct; pronotum with median carina slightly raised; spermatheca with apical divertioculum very long and slender ..... **Cyrtacanthacridinae** Kirby, 1910

8. Body medium to large size; integument smooth; last abdominal tergite in male without well developed furcula; male subgenital plate without transverse fold; bridge of epiphallus usually undivided medially 9

--- Body small to medium size; integument rough; last abdominal tergite in male with well developed furcula; male subgenital plate with transverse fold; bridge of epiphallus divided medially ..... **Coptacridinae** Brunner, 1893

9. Pronotum with lateral carinae linear; male cercus strongly compressed apex downcurved ..... **Eyprepocnemidinae** Brunner, 1893

--- Pronotum without lateral carinae, if present, never linear; male cercus variable, never strongly compressed, apex normal .....**Catantopinae** Brunner, 1893

SUBFAMILY GOMPHOCERINAE FIEBER, 1853

Gomphocerinae, Fieber. 1853. *Lotos* 3: 90-104, 115-129.

Comments: Dirsh (1965) placed the Gomphocerine genera under the subfamily Truxalinae. Uvarov (1966) divided the Truxalinae of Dirsh (1965) into two groups: Gomphocerinae in which the stridulatory file consists of a series of peg hairs, and Truxalinae in which the file consists of unmodified hairs lying between peg-like cuticular expansion.

Rehn and Grant (1960) attacked subfamily criteria of Uvarov. They were of the opinion that heavy emphasis on stridulatory mechanism was unjustified. Jago (1969, 1971) followed Uvarov (1966) and used the name and subfamily rank Gomphocerinae. Harz (1975), Dirsh (1975) and other recent workers also treated Gomphocerinae as subfamily of Acrididae.

Diagnosis: Body small to medium size, usually moderately slender, laterally compressed; antennae usually filiform; pronotum with median and lateral carinae; prosternal process usually absent, if present then antennae ensiform and body strongly elongate; expanded area of tegmina without medial veins; tympanum present; hind femur with stridulatory file represented by articulated pegs, lower basal lobe shorter than upper one.

Male cercus weakly conical; Epiphallus, bridge undivided, ancorae and lophi present; aedeagus, basal and apical valves connected by flexure, basal valve with gonopore process well developed; spermatheca, apical diverticulum small or rudimentary, pre-apical diverticulum sac like.

The subfamily is represented by six genera from this region. A key for their separation is given below:

Key to genera of the subfamily Gomphocerinae Fieber, 1853

1. Head much longer than pronotum; fastigium of vertex as long as or longer than eye length; antennae ensiform ..... ***Brachychrotaphus*** Krauss, 1877
--- Head as long as or shorter than pronotum; fastigium of vertex shorter than eye length; antennae filiform (except in *Ochrilidia* Stal)..... 2
2. Fastigial foveolae weak, hardly visible from above; fastigium of vertex without median carinula; pronotum with lateral carinae angularly incurved; arolium of small size..... ***Leva*** Bolivar, 1909
--- Fastigial foveolae deep, visible from above; fastigium of vertex with median carinula; pronotum with lateral carinae straight, slightly diverging in metazoan; arolium of medium size 3
3. Valvulae of ovipositor exserted, free 4
--- Valvulae of ovipositor covered by supra anal plate .... ***Dociostaurus*** Fieber, 1853
4. Pronotum constricted ..... ***Chorthippus*** Fieber, 1852
--- Pronotum not constricted 5
5. Pronotum with lateral carinae entirely dorsal .... ***Aulacobothrus*** Bolivar, 1902
--- Pronotum withlateral carinae sharply angulated inwards before the middle .... ***Leionotacris*** Jago, 1996

Genus *Brachycrotaphus* Krauss, 1877

Brachycrotaphus Krauss. 1877. *S.B. Akad. Wiss. Wien, Math.-Nat. Kl.* **76**(1): 48.

Type-species: *Brachycrotaphus steindachneri* Krauss, 1877.

Psectrocnemus Henry, 1940: 511. Syn. by (Jago, 1969. *Proc. Acad. Nat. Sci. Philad.* : 256).

Type-species: *Ochrilidia longiceps* I. Bolivar, 1902.

Diagnosis : Size small to medium; body short, cylindrical, usually moderately slender, laterally compressed; head obtusely conical, short, without fastigial furrow; frons in profile, vertical; eyes not nearer to its apex than to its base; fastigium of vertex short, angular or rounded at apex; fastigial foveolae concave or flat; antennae usually filiform; dorsum of pronotum flat, subcylindrical or slightly saddle-shaped, with median and lateral carinae; prosternal process usually absent, if present, then antennae ensiform and body strongly elongated; tegmina and wings fully developed, shortened, rarely absent, reticulation sparse, intercalary vein of medial area of tegmen absent; hind femur moderately widened, never extermely narrow; femero-tegminal stridulatory mechanism present consisting row of modified peg-like hairs located on lower edge of the inner areas of hind femur, its stridulatory file with articulated pegs; knees of hind femur with rounded or obtuse-angular lobes, lower basal lobe shorter than upper one; tympanum present; external apical spine absent.

The genus is represented by a single species from this region.

Brachycrotaphus longiceps (Bolivar, 1902)

(Plate 4; Fig. 1)

Ochrilidia longiceps Bolivar, 1902 . *Ann. Soc. ent. Fr.* **70**: 595.

Psectrocnemus longiceps Henry, 1940. *Trans. R. Entomol. Soc. London* **90** (19): 511.

Brachycrotaphus longiceps (I. Bolivar) ; Jago, 1969. *Proc. Acad. Nat. Sci. Philad*: 255.

Brachycrotaphus longiceps (I. Bolivar) ; Jago, 1971. *Proc. Acad. Nat. Sci. Philad* : 235.

Female genitalia: Supra-anal plate elongated triangular, longer than wide, apex obtusely rounded. Cercus short, broad, longer than wide, apex obtusely rounded. Sub genital plate lateral margin straight, posterior margin broadly rounded, setose marginally, egg-guide short, broad slightly longer than wide, apex obtusely rounded, jannone's organ absent. Spermatheca apical diverticulum long, narrow apically and broad basally, sac like, pre-apical diverticulum short, tubercle like. Ovipositor valves moderately robust, almost as long as lateral apodeme, dorsal valve broad, deep curved, apex pointed, ventral valve with deep curved, apex acutely ronded, basal sclerite narrow, mesial tooth prominent.

Material Examined: Assam, Morigaon, Moirabari, 18-X-2009, on grasses, 5♀♀.

Morphometry: (length in mm)

Female: Body 16.0, Pronotum 4.4, Tegmina 17.5, Hind Femur 8.6

Distribution: India: Punjab and Rajsthan.

Elsewhere: Aden, Afghanistan, Iran, North Africa, Pakistan and Saudi Arabia.

Genus *Leva* Bolivar, 1909

Leva Bolivar, 1909. *Bol. R. Soc. Esp. Hist. Nat.* 9: 292.

Type-Species: *Gymnobothrus indicus* Bolivar, 1902.

Stenohippus Uvarov, 1926: 423. Syn. by (Jago, 1971. *Proc. Acad. Nat. Sci. Philad.*: 223).

Type-species: *Chorthippus* (*Stauroderus*) *xanthus* Karny, 1907.

Diagnosis: Body of small size; antennae filiform, longer than head and pronotum together; head subconical, shorter than pronotum; vertex without lateral carinulae; fastigium of vertex elongate-angular, concave, without median carinula, shorter than

eye length; fastigial foveolae not visible from above; frontal ridge shallowly sulcate; pronotum sub cylindrical, slightly constricted, median carina crossed by posterior transverse sulcus only, lateral carinae angularly incurved; metazona about half as long as prozona, posterior margin obtuse-angular; prosternal process absent; mesosternal interspace open; tegmina and wings fully developed, base of anterior margin of tegmina with small projection; hind femora slender; hind tibia with inner spur of inner side as long as external one; arolium small. Male: supra-anal plate elongate-angular, cercus short, narrow-conical; sub genital plate short, subconical, with obtuse apex; Epiphallus, bridge moderately narrow, ancorae short, incurved, lophi bilobate; aedeagus, apical valve narrower and much shorter than basal valve. Female: sub genital plate, posterior margin without setae and with a conical projection medially; ovipositor, dorsal valve much shorter than lateral apodeme; spermatheca, apical diverticulum short, pre-apical diverticulum sac like.

Leva indica (Bolivar, 1902)

(Plate 5; Fig. 2)

Gymnobothrus indicus I. Bolivar, 1902, *Annls. Soc. Ent. Fr.* , 596.
Leva indica (I. Bolivar); I. Bolivar, 1909, *Bol. Soc. esp. Hist. nat.*, **9**: 292.
Leva cruciata Bolivar, 1914. I. *Trab. Mus. Cienc. Nat. Madr.*, **6**: 66.

Male genitalia: Supra-anal plate broad, short, as long as wide, lateral margins curved medially, apex obtusely rounded; apex uniformly broad, two and a half times as long as wide, apex rounded. Sub genital plate wide, flattened, slightly wider than long, apex obtusely conical. Epiphallus with bridge narrow, undivided, ancorae short with pointed apices; lophi small, single lobed. Aedeagus flexured, apical valve narrow, curved,

narrower and slightly shorter than basal valve, connected with basal valve with flexure; apex pointed; basal valve moderately broad basally.

Material Examined: Meghalaya, Shillong, Cherapunji, 23-X-2008, on grasses, 7♂♂.

Morphometry: (length in mm)

Male: Body 15.2-15.0, Pronotum 7.3-7.5, Tegmina 14.0-14.9, Hind femur 10.1-10.5

Distribution: India : West Bengal, Delhi, Tamil Nadu, Tripura and Uttar Pradesh.

Genus *Dociostaurus* Fieber, 1853

Dociostaurus Fieber, 1853. *Lotos* **3**: 118.
Karny. 1907. S.B. Akad. *Wiss. Wien, Math.-Nat. Kl.* (Abt. 1) **116**: 363-364.
Type-Species: *Chorthippus (Stauroderus) xanthus* Karny, 1907.

Diagnosis: Head large, slightly ascending; fastigium of the vertex triangular, separated on each side from the eye by a well-marked carina; foveolae of the vertex rather superior, broad, rhomboidal, converging towards the tips. Antennae filiform, as long as the head and pronotum together; face slightly obligue, flattened, and hardly sulcated. Pronotum strongly constricted before the middle, tricarinate, the lateral carinae angulated inwards. The sulci scarcely indicated; the deflexed lobes much higher than long, with a short curved pale carina on the metapleura. Tegmina and wings perfectly developed; tegmina rather long and narrow, short than the tegmina, hyaline. Hind femora as long as the abdomen, simple. Hind tibiae spinose, with the two inner apical spurs subequal; hind tarsi very slender, with the claws and arolium small. Sub genital lamina horizontally produced in the male; valves of the ovipositor smooth, short.

Dociostaurus (Dociostaurus) apicalis (Walker, 1871)

(Plate 6; Fig. 3)

Stenobothrus apicalis Walker, F. 1871. Catalogue *of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum Supplement:* 80.

Stenobothrus turbatus Walker, F. 1871. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum Supplement:* 81.

Dociostaurus apicalis (Walker) Kirby, W.F. 1914. *Fauna of British India, including Ceylon and Burma.* Orthoptera (Acrididae) 118.

Male genitalia: Supra-anal plate slightly longer than wide, lateral margin diverging posteriorly, apex broadly rounded. Cercus straight, uniformaly broad, more than two times as long as wide, apex acutely rounded. Sub genital plate with lateral margins straight, diverging posteriorly, apex semicircular. Epiphallus bridge shaped, bridge narrow, undivided, lophi well developed. Lateral plates straight with anterior projection prominent, posterior projection rounded. Aedeagus apical valve uniformly broad, downcurved, much shorter than basal valve, apex pointed.

Material Examined: Meghalaya, Shillong, Cherapunji, 23-X-2008, on grasses, 7♂♂.

Morphometry: (length in mm)

Male: Body 15.25, Tegmina 9.94, Pronotum 1.0, Hind femur 9.85

Distribution: India: Meghalaya.

Genus *Chorthippus* Fieber, 1852

Chorthippus Fieber, 1852. In Kelch. *Grundlage zur Kenntnis der Orthopteren Gradflügler) Oberschlesiens, und Grundlage zur Kenntnis der Käfer Oberschlesiens, erster Nachtrag (Schulprogr.).* Ratibor 1.

Type-species: *Acrydium albomarginatum* De Geer, 1873.

Megaulacobothrus Caudell, 1921: 27. Syn. by (Mishchenko, 1951. *Catantopinae*: 137).

Type-species: *Megaulacobothrus fuscipennis* Caudell, 1921.

Plagiophlebis Houlbert, 1927: 94. Syn. by (Mishchenko, 1951. *Catantopinae*: 137).

Diagnosis: Body small to medium size; antennae filiform, longer than head and pronotum together; head subconical, shorter than pronotum; fastigium of vertex angular, shorter than eye length, depressed with median carinula; fastigial foveolae deep, visible from above; frontal ridge flat; pronotum flat, slightly tectiform, median carina crossed by posterior transverse sulcus only, lateral carinae straight and parallel in prozona and slightly diverging in metazona; metazona about as long as prozona, posterior margin obtuse-angular; mesosternal interspace open; tegmina and wings fully developed or shortened, base of anterior margin of tegmina with small projection; hind femora slender; arolium of medium size. Male: supra anal plate elongate-angular; cercus short, narrow-conical with obtuse apex; sub genital plate short, subconical; Epiphallus, with moderately narrow bridge, ancorae incurved, lophi bilobate or trilobite. Female: sub genital plate, posterior margin minutely setose and truncated; ovipositor, dorsal valve much shorter than lateral apodeme; spermatheca, pre-apical diverticulum sac like.

The genus is represented by a single species from this region.

***Chorthippus indus* (Uvarov, 1942)**

(Plate 7; Fig. 5)

Chorthippus indus Uvarov, 1942. *Trans. Amer. Ent. Soc.*, **67**: 1-336.

Chorthippus indus Uvarov; Bei-Bienko & Mishchenko, 1951. *Akad. Nauk SSSR,* Moscow, 38: xxi+400pp.

Male genitalia: Supra-anal plate elongate-angular; cercus short, narrow-conical with obtuse apex; sub genital plate short, subconical; Epiphallus, with moderately narrow

bridge, ancorae incurved, lophi bilobate or trilobite. Aedeagus apical valve short, narrow, apex blunt, basal valve elongate, uniformly broad, twice as long as apical valve.

Female genitalia: Supra-anal plate elongate, as long as wide, broadly angular, apex obtusely rounded, cercus elongate, broad basally, narrowing apically, twice as long as wide, apex elongate conical. Sub genital plate with posterior margin minutely setose and truncated; egg-guide slender narrowing apically. Spermatheca with apical diverticulum short, pre-apical diverticulum well developed and sac like. Ovipositor with dorsal valve much shorter than lateral apodeme, apex obtuse; ventral valve with well developed tooth, apex acute.

Material Examined: Meghalaya, Jowai, Thaldskin, 22-X-2008 on grasses, 5♀♀, 8♂♂.

Morphometry: (length in mm)

Male: Body 14.41, Tegmina 9.1, Pronotum 1.23, Hind femur 9.7

Female: Body 9.8, Pronotum 6.1, Tegmina 14.7, Hind Femur 11.3

Distribution: India : Jammu & Kashmir, Uttar Pradesh.

Genus *Aulacobothrus* Bolivar, 1902

Aulacobothrus Bolivar, 1902. *Annls. Soc. Ent. Fr.*, 596.
Type-species: *Aulacobothrus strictus* Bolivar, 1902.

Diagnosis: Body of medium size; antennae filiform, as long as or longer than head and pronotum together; head subconical, shorter than pronotum, vertex with lateral carinulae; fastigium of vertex almost trapezoidal, concave, without median carinula, shorter than eye length; fastigial foveolae weakly concave, hardly visible from above; frontal ridge flat, pronotum flattened, slightly constricted, median carina sharp, linear,

crossed by posterior transverse sulcus only, lateral carinae angularly incurved, sometimes irregular; metazona about as long as or slightly longer than prozona, posterior margin obtuse-angular; mesosternal interspace open; tegmina fully developed, base of anterior margin with small projection; hind femur moderately slender; hind tibia with inner spur of inner side slightly longer than external one; arolium of small size. Male: supra anal plate angular, cercus narrow, acutely conical; sub genital plate short, subconical, with obtuse apex; Epiphallus, bridge narrow, ancorae short, lophi bilobate; aedeagus, apical valve narrower and much shorter than basal valve. Female: sub genital plate, posterior margin with a wide conical projection medially; ovipositor, dorsal valve shorter than lateral apodeme; spermatheca, apical diverticulum short, pre-apical diverticulum sac like.

The genus is represented by two species from this region. A key for their separation is given below:

Key to Indian species of *Aulacobothrus* Bolivar, 1902

1. Dorsum of head and pronotum with a pale stripe extending from anterior margin of fastigium to posterior margin of pronotum; Frontal ridge sulcate .... ***A. l. luteips*** Walker, 1871

--- Dorsum of head and pronotum without a pale stripe; Frontal ridge flat, broad at base ..... ***A. taeniatus*** Bolivar, 1902

***Aulacobothrus taeniatus* Bolivar, 1902**

(Plate 8; Fig. 4)

Aulacobothrus taeniatus Bolivar 1902. *Ann. Soc. Ent. Fr., Paris*, **70**: 600.

Aulacobothrus taeniatus Kirby, 1910. *Syn. Cat.Orth.*,: 125.

Aulacobothrus taeniatus Bolivar, 1914a. *Trab. Mus.Cienc. nat. Madr.*, **6**: 55.

Stauroderus bicolour Kirby, 1914. *Fauna Brit. India, Orth.*,: 127.

Aulacobothrus physopoda *Kirby,* 1914. *Fauna Brit. India, Orth.*,: 125.

Aulacobothrus taeniatus Bolivar, 1918. *Rev. Acad. Cienc. Madr.*, **16**: 381.

Aulacobothrus taeniatus Jago, 1971. *Proc.Acad. nat. Sci.Philed,* **123**(8): 245.

Aulacobothrus taeniatus Ingrisch, 1993. *Ent. Scand.* , **24**(3): 325.

Female genitalia: Supra-anal plate angular, broad basally, narrowing apically, obtusely rounded at apex. Cercus, short, broad, narrowing at apex, twice as long as wide, apex acutely rounded. Sub genital plate elongated, lateral margin straight, posterior margin rounded smooth without setae, jannone's organ present, egg-guide broad basally, narrowing apically, longer than broad, apex pointed. Spermatheca apical diverticulum uniformaly broad, elongate and sac like, pre-apical diverticulum absent. Ovipositor valves robust, shorter than lateral apodeme, dorsal valve broad with deep curve, obtusely rounded at apex, ventral valve robust, slightly curved, apex rounded, basivalvular sclerite narrowing apically.

Material Examined: Meghalaya, Rai Bhoi, Ummolong, 22-X-2008, on grasses, 5♀♀.

Morphometry: (length in mm)

Female: Body 20.5, Pronotum 4.00, Tegmina 1.1, Hind femur 10.0

Distribution: India: Tamil Nadu and West Bengal.

Elsewhere: China, Europe, Japan, Myanmar and North Africa.

Aulacobothrus luteipes luteipes **(Walker, 1871)**

(Plate 9; Fig. 6)

Stenobothrus luteips Walker, 1871. *Cat. Derm. Salt. Br. Mus.* London, 62.

Aulacobothrus luteips (Walker); Uvarov, 1921. *Ann. Mag. Nat. Hist.,* 7(9): 482.

Female genitalia: Supra-anal plate broad, lateral margin angular, narrowing apically, as long as wide, cercus broad, slightly narrowing apically, twice as long as wide and obtusely rounded at apex. Sub genital plate with lateral margin straight, posterior

margin wavy, with notch medially, setose marginally, jannone's organ streak like, egg-guide broad medially and narrowing apically, more than two times as long as wide, apex acutely rounded. Ovipositor valves shorter than lateral apodeme, dorsal valve broad, robust with deep curve, apex pointed, ventral valve uniformly narrow with deep curve, tip pointed, mesial tooth not prominent, basal sclerite triangular.

Material Examined: Assam, Morigaon, Moirabari, 18-X-2009, on grasses, 8♀♀; Assam, Nagaon, 18-X-2009, on grasses, 7♀♀.

Morphometry: (length in mm)

Female: Body 22.1, Pronotum 4.8, Tegmina 24.2, Hind Femur 15.0

Distribution: India: Assam.

Genus *Leionotacris* Jago, 1996

Leionotacris Jago. 1996. *Jour. Orth. Res.* 5: 86.

Type-Species: *Dnopherula gilloni* Hollis, 1966.

Diagnosis : Vertex subtriangular, obtuse ; foveolae superior, narrow well-marked ; antennae filiform ; front hardly obligue, frontal ridge carinated. Pronotum with the lateral carinae sharply angulated inwards before the middle ; tegmina longer than abdomen, the mediastinal area slightly expanded on the costa near the base, and not extending beyond the middle of the tegmina ; wings hyaline.

The genus is represented by a single species from this region.

Leionotacris bolivari (Uvarov, 1921)

(Plate 10; Fig. 7)

Dnopherula (Aulacobothrus) bolivari; Bhowmik, 1985b. *Rec. zool. Surv. India, Occ. Pap.* No., **78**: 21.

Aulacobothrus bolivari Uvarov, 1921. *Ann. Mag. nat. Hist. London,* 7(9): 483.

Pseudoarcyptera collinus Uvarov, 1929. *Rev. Suisse Zool*, **36**: 543. Syn. by Ingrisch. 1993. *Entomologica Scandinavica* **24**(3): 335.

Dnopherula (Aulacobothrus) bolivari; Shishodia & Mandal, 1990. *Rec. zool. Surv. India*, **87**(1): 67.

Dnopherula (Dnopherula) bolivari; Ingrisch, 1993. *Ent. Scand*, **24**(3): 333.

Leionotacris bolivari Jago, 1996. *Jour. Orth. Res.* **5**: 87.

Dnopherula (Aulacobothrus) collinus; Mandal & Yadav, 2007. State Fauna Series, **5**: Fauna of Andhra Pradesh, Part 3, *Zool. Surv. India*,: 192.

Female genitalia: Supra-anal plate broad, as long as wide, apex bluntly rounded, cercus short, broad, narrowing apically, twice as long as wide, apex bluntly rounded. Sub genital plate, posterior margin with a wide conical projection medially, setose laterally, egg-guide short, twice as long as wide; spermatheca, apical diverticulum elongate narrow, pre-apical diverticulum broad and sac like. Ovipositor valves short, tips acute, dorsal valve three times as long as wide, shorter than lateral apodeme, dorsal condyle not prominent, ventral valve short, slightly curved, basal sclerite narrow.

Material Examined: Meghalaya, Rai Bhoi, Thaldskin, 22-X-2008, on grasses, 6♀♀.

Morphometry: (length in mm)

Female: Body length 20.48, Tegmina 13.18, Pronotum 1.57, Hind femur 13.87

Distribution: India: Madhya Pradesh and Tammil Nadu.

Elsewhere: China and Northern Thailand.

SUBFAMILY ACRIDINAE MacLeay, 1821

Acridinae, MacLeay. 1821. *Horae entomologicae: or essays on the annulose animals.* Bagster, vol. **1**, part. 2, p. 161-524.

Diagnosis: Body small to large size, laterally compressed; head acute, sometimes obtusely conical; frons oblique; pronotum with median and lateral carinae well developed; prosternal process well developed; prosternal process generally absent; tegmina and wings fully developed or shortened; medial area of tegmen usually without intercalary vein; stridulatory mechanism absent; tympanum present; hind femur without stridulatory pegs on inner side; lower basal lobe shorter than upper one; hind tibia without external apical spine; arolium large.

Male cercus narrow-conical, with rounded apex; Epiphallus, bridge undivided, ancorae large, lophi small bilobate; aedeagus, basal and apical valves connected by flexure, basal valve with well developed gonopore process. Female ovipositor, short, slightly curved, valves not toothed; spermatheca, apical diverticulum short, pre-apical diverticulum sac like.

The subfamily is represented by three genera from this region. A key for their separation is given below:

Key to the genera of the subfamily Acridinae MacLeay, 1821

1. Head never elongate; Hind femur never very long and slender 2
--- Head elongate; hind femur very long and slender ..... ***Acrida*** Linnaeus, 1758
2. Pronotum with lateral carinae straight, nearly parallel .....
..... ***Phlaeoba*** Stal, 1860
--- Pronotum with lateral carinae diverging in metazoan .....
..... ***Orthochtha*** Karsch, 1891

Genus *Acrida* Linnaeus, 1758

Acrida Linnaeus. 1758. *Systema Naturae per Regna tria naturae* (10th ed.) 1: 427.

Type-species: *Gryllus (Acrida) turritus* Linnaeus, 1758.

Diagnosis: Body strongly elongate; antennae ensiform, as long as or shorter than head and pronotum together; head strongly elongate, ascending conically; fastigium of vertex elongate; fastigial foveolae absent; frontal ridge shallowly sulcate; pronotum elongate, median carina well developed, crossed by posterior transverse sulcus, lateral carinae straight or slightly excurved; metazona about as long as prozona, posterior margin obtuse or acute angular; prosternal process absent; mesosternal interspace open; tegmina fully developed, apex acute; wings with median area widened, forming speculum; hind femur much elongate; arolium large. Male: supra anal plate elongate-angular, cercus narrow, conical with obtuse apex; subgenital plate elongate, acutely conical; Epiphallus, ancorae large, lophi bilobate, aedeagus, apical valve narrower and shorter than basal valve. Female: subgenital plate, posterior margin setose and trilobite; ovipositor, dorsal valve much shorter than lateral apodeme; spermatheca, apical diverticulum developed, much shorter than pre-apical diverticulum which is sac like.

The genus is represented by two species from this region. A key for their sepraton is given below:

Key to species of the genus *Acrida* Linnaeus, 1758

1. Body greenish; lateral carina of pronotum not edged with in with black line..... ***A. exaltata*** Walker, 1859

--- Body dry grass coloured; lateral carina of pronotum edged with in with black line..... ***A. gigantea*** Herbst, 1794

Acrida exaltata (Walker, 1859)

(Plate 11; Fig. 8)

Truxalis exaltata Walker, 1859. *Ann. Nat. Hist.* **4**(3): 222.

Tryxalis brevicolis Bolivar, 1893. *Feuille Jeunes Nat.* 23: 162. Syn. by Kirby, 1910. *A Synonymic Catalogue of Orthoptera* (Orthoptera Saltatoria, Locustidae vel Acridiidae) **3**(2): 103.

Acrida lugubris Burr, 1902. *Trans. Ent. Soc. Lond.* 157. Syn. by Uvarov, 1921: *Ann. Mag. nat. Hist,* 7(9): 481.

Acrida curta Uvarov, 1936. *Linn. Soc. J. Zoology*, 39. Syn. by Dirsh & Uvarov, 1953: *Tijdschr. Ent.* **96** (3): 231. Syn. by Dirsh & Uvarov. 1953. *Tijdschr. v. Entomologie,* **96**: 232.

Acrida exaltata (Walker); Willemse, 1951. *Publties natuurh. Genoot.* Limburg, **4**: 100.

Male genitalia: Supra-anal plate broadly angular, slightly longer than wide, lateral margins slightly curved medially apex obtusely conical; cercus uniformly broad, less than three times as long as wide, apex broadly rounded. Sub genital plate elongate-angular, longer than wide, apex obtusely rounded. Epiphallus with moderately broad median bridge, its anterior margin convex with small paired, bilobed, nodulated lophi and blunt, peglike ancorae. Aedeagus flexured, apical valve narrow, curved, shorter than basal valve, connected with basal valve with flexure, apex pointed; basal valve broad basally.

Female genitalia: Supra-anal plate wide, flattened, as long as wide, apex obtusely conical; cercus short, longer than wide, apex obtusely rounded. Sub genital plate with posterior margin slightly convex in middle; posterior marginal setae and jannone's organs present; egg-guide long, three and a half times as long as wide. Spermatheca with apical diverticulum short, apex truncated, shorter than pre-apical diverticulum; pre-apical diverticulum is sac like. Ovipositor with dorsal valve broad, slightly more

than three times as long as wide, shorter than lateral apodeme; ventral valve with apical tip short, basal sclerite narrow and tuberculate; mesial valve slightly dilated apically.

Material Examined: Assam, Guwahati, Sansari, 29-X-2008, on paddy field, 4♀♀, 2♂♂. Arunachal Pradesh, East Siang, Pasighat, 2-II-2009, on grasses, 7♀♀, 2♂♂, 3-II-2009, on grasses, 2♀♀. Manipur, West Imphal, 15-X-2009, on grasses, 4♀♀, 3♂♂.

Morphometry: (length in mm)

Male: Body length 32.17, Tegmina 26.21, Pronotum 1.41, Hind femur 19.79

Female: Body length 49.89, Tegmina 45.48, Pronotum 2.56, Hind femur 31.74

Distribution: India: Sikkim, Kashmir, Himalyas, Assam and Uttar Pradesh.

Acrida gigantea (Herbst, 1786)

(Plate 12; Fig. 9)

Truxalis gigantea Herbst, 1786. *Fuessly Archiv*;: 191.

Acrida gigantea Shrinivasan; 1986a. Eastern Ghats insects, Part 1, *Zoo. Surv. India,* Madras,: 10.

Acrida gigantea (Herbst); Kirby, 1914. *Fauna Brit, Orth.*,: 98.

Acrida gigantea Tandon & Shishodia; 1995. Himalayan Ecosystem Series: Fauna of Western Himalaya (U.P), Par 1, *Zoo. Surv. India,*: 37.

Acrida gigantea Joshi *et al*; 2004. *Journal of Tropical Forestry*, **20**(3-4): 72.

Acrida gigantea Shishodia, 2006a. *Bionotes*, **8**(1): 11.

Acrida gigantea Shishodia, 2008b. Faunal Diversity of Jabalpur district, M.P., (*Zool. Surv. India*): 97.

Male genitalia: Supra-anal plate triangular, longer than wide, apex rounded, cercus elongate, three times as long as wide, apex acutely rounded. Sub genital plate elongate, much longer than broad, narrowing apically. Epiphallus bridge shaped, ancorae well

developed, lophi triangular, bridge narrow, uniformly broad. Aedeagus, basal valve broader and longer than apical valve, apical valve narrow, upward, apex pointed.

Female genitalia: Supra-anal plate broad, broader than long, apex pointed, cercus small, broad, narrowing apically, twice as long as wide, apex rounded. Sub genital plate, posterior margin entirely setose, surface with two small patches, egg-guide narrow, elongate, four times as long as wide. Spermatheca, apical diverticulum broad, sac like, wider and longer than pre-apical diverticulum. Apical diverticulum short and broad. Ovipositor dorsal valve broad, margin smooth, apical tip rounded, ventral valve with apical tip acutely rounded, serrated, apodeme considerably longer than dorsal valve.

Material Examined: Arunachal Pradesh, East Siang, 2- II-2009 on grasses 7♀♀, 2♂♂. Assam, Guwahati, 29-X-2008 on paddy field 4♀♀, 2♂♂.

Morphometry: (length in mm)

Male: Body length 27.3, Tegmina 21.6, Pronotum 5.6, Hind femur 18.9

Female: Body length 47.8, Tegmina 43.1, Pronotum 9.1, Hind femur 22.5

Distribution: India: Himachal Pradesh, Madhya Pradesh, Tamil Nadu and Uttarakhand.

Elsewhere: Malaysia and Malaya.

Genus *Phlaeoba* Stal, 1860

Phlaeoba Stal. 1860. Kongliga Svenska fregatten Eugenies Resa omkring jorden under befäl af C.A. Virgin åren 1851-1853 (Zoologi) **2**(1): 340.

Type-species: *Gomphocerus (Phlaeoba) rusticus* Stal, 1860.

Kirbyella I. Bolivar, 1909: 289. (Preoccupied by *Kirbyella* Kirkaldy, 1906: 248 in Hemiptera).

Amycus Shiraki. 1910: 59. (Willemse, 1951: *Public. Nat. Hist. Gen. Limburg*, 78).

Ybrika I. Bolivar, 1916: 278. (Replacement name for *Kirbyella* I. Bolivar, 1909). (Willemse, 1951: *Public. Nat. Hist. Gen. Limburg*, 78).

Diagnosis: Body small to medium size; antennae ensiform, as long as or longer than head and pronotum together; head normal; vertex with distinct median carinula; fastigium of vertex depressed with median and lateral carinulae; fastigial foveolae not visible from above; frons slightly oblique; frontal ridge deeply sulcate, slightly widened towards the clypeus; pronotum rugosely punctured, median carina crossed by posterior transverse sulcus only, lateral carinae straight, nearly parallel; metazona slightly shorter than prozona, posterior margin broadly truncate; prosternal process absent; mesosternal interspace open; tegmina and wings fully developed; hind femur thickened; arolium of median size.

The genus is represented by four species from this region. A key for their separation is given below:

Key to Indian species of *Phlaeoba* Stal, 1860

1. Lateral carina of pronotum distinct 2

--- Lateral carina of pronotum indistinct or coarsely indicated or absent, pronotum coarsely punctured ..... ***P. tenebrosa*** Walker, 1871

Wings more or less fuscous at apex 3

--- Wings hyaline ..... ***P. panteli*** Bolivar , I., 1902

2. Antennae ringed or tipped with obscure yellow .....

..... ***P. anqustidorsis*** Bolivar , I., 1902

--- Antennae unicolorous ..... ***P. infumata*** Brunner, 1893

Phlaeoba infumata Brunner, 1893

(Plate 13; Fig. 10)

Phlaeoba infumata Brunner von Wattenwyl, 1893. *Ann. Mus. Civ. Stor. Nat. Genova* **213**(33): 124.

Phlaeoba infumata (Brunner); Kirby, W.F. 1914. *Fauna of British India, including Ceylon and Burma. Orthoptera (Acrididae)* 103.

Phlaeoba infumata (Brunner); Uvarov, 1921. *Ann. Mag. nat. Hist.* **97**: 486.

Phlaeoba infumata (Brunner); Willemse, C. 1951. *Publ. natuurhist. Genootsch. Limburg* **4**: 85.

Male genitalia: Supra-anal plate broadly triangular, slightly longer than wide, apex broadly rounded; cercus broad, narrowing apically, two and a half times as long as wide, apex rounded. Sub genital plate wide, flattened, broad basally, obtusely narrowing apically, longer than wide, apex elongate, incurved, rounded. Epiphallus with bridge narrow, ancorae moderate, with pointed apices, lophi small, single lobed. Aedeagus flexured, apical valve narrow, strongly curved, upward, much narrower and shorter than the basal valve, apex pointed, basal valve broad and dilated basally.

Female genitalia: Supra-anal plate wide, flattened, wider than long, apex obtusely rounded, cercus short, broad, one and a half times as long as wide, apex rounded. Sub genital plate with posterior margin having triangular projection in middle; posterior marginal setae and jannone's organs present; egg-guide slightly more than twice as long as wide. Spermatheca with apical diverticulum short and tubercle-like, pre-apical diverticulum well developed and sac like. Ovipositor with dorsal valve narrow, slightly more than four times as long as wide, shorter than lateral apodeme; ventral valve with apical tip long and pointed, slope deeply concave, mesial tooth truncated, basal sclerite setose on apical half.

Material Examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 9♀♀, 2♂♂; Jowai, Ummalong, 22-X-2008, on grasses, 7♀♀, 3♂♂. Arunachal Pradesh, Papumpare, Itanagar, 1-II-2009, on grasses, 15♀♀, 5♂♂; 1-II-2009, on grasses, 10♀♀, 3♂♂. Mizoram, Aizwal, Selesih, 11-II-2009, on grasses, 5♀♀, 2♂♂. Tripura, Agartala, Lembucherra, 13-II-2009, on grasses, 15♀♀, 5♂♂. Manipur, East Imphal, 17-X-2009, on grasses 8♀♀, 5♂♂. Nagaland, Dimapur, 19-X-2009, on grasses, 4♀♀, 3♂♂.

Morphometry: (length in mm)

Male: Body length 20.89, Tegmina 16.4, Pronotum 1.98, Hind femur 13.15

Female: Body length 26.5, Tegmina 22.7, Pronotum 2.44, Hind femur 16.95

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chattisgarh, Delhi, Goa, Haryana, Himachal Pradesh, Madhya Pradesh and Manipur.

Elsewhere: Bangladesh, East Nepal, Hainan Islands and Myanmar.

***Phlaeoba panteli* Bolivar, 1902**

(Plate 14; Fig. 11)

Phlaeoba panteli Bolivar, 1902 . *Ann. Soc. ent. Fr.* **70**: 589.

Phlaeoba wathousei Kirby, W.F. 1910. A Synonymic Catalogue of Orthoptera (*Orthoptera Saltatoria, Locustidae vel Acridiidae*) **3**(2): 361.

Phlaeoba panteli (Bolivar); Kirby, W.F. 1914. *Fauna of British India, including Ceylon and Burma. Orthoptera (Acrididae)* 105.

Male genitalia: Supra-anal plate triangular, cercus straight, conical; Sub genital plate short, with obtuse apex; Epiphallus, bridge moderately narrow, ancorae short, lophi lobiform; Aedeagus, apical valve narrower and much shorter than basal valve.

Female genitalia: Supra-anal plate elongate, one and half times as long as wide apex rounded,cercus uniformly broad, two and half times as long as wide, apex rounded. Sub

genital plate, posterior margin setose, with a median projection; spermatheca, apical diverticulum rudimentary, pre-apical diverticulum well developed and sac like. ovipositor, dorsal valve shorter than lateral apodeme, tips acute.

Material Examined: Sikkim, Gangtok, Ranka, 14-X-2008, on grasses, 3♀♀, 2♂♂. Meghalaya, Rai Bhoi, Umaran, 25-X-2008, on grasses, 6♀♀, 2♂♂; 21-X-2008, on grasses, 4♀♀. Tripura, Agartala, Kamalghat, 14-II-2009, on grasses, 7♀♀. Manipur, West Imphal, 15-X-2009, on grasses 4♀♀, 2♂♂.

Morphometry: (length in mm)

Male: Body length 19.10, Tegmina 15.0, Pronotum 1.15, Hind femur 12.15

Female: Body length 33.39, Tegmina 19.19, Pronotum 2.70, Hind femur 19.22

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Bihar, Himachal Pradesh, Madhya Pradesh, Manipur, Meghalaya, Tripura, Tamil Nadu, Uttarakhand and West Bengal.

Elsewhere: Afghanistan.

Phlaeoba angustidorsis Bolivar, 1902

(Plate 15; Fig. 12)

Phlaeoba angustidorsis Bolivar, 1902 . *Ann. Soc. ent. Fr.* **70**: 590.

Phlaeoba angustidorsis (Bolivar); Kirby, W.F. 1914. *Fauna of British India, including Ceylon and Burma.* Orthoptera (Acrididae) 104.

Male genitalia: Supra-anal plate elongate narrow, two times as long as wide, apex rounded, cercus elongate, narrowing apically, three times as long as wide, apex rounded. Sub genital plate broad, apex broadly rounded. Epiphallus bridge shaped, bridge narrow, ancorae and lophi developed, ancorae with tips pointed. Aedeagus, basal valve broad, shorter than apical valve. Apical valve elongate, narrow, pointed apically.

Material Examined: Sikkim, Gangtok, Ranka, 14-X-2008 on grasses, 5♂♂.

Assam, Guwahati, Patorkuchi, 30-X-2008, on grasses, 2♂♂.

Morphometry: (length in mm)

Male: Body length 18.7, Tegmina 11.3, Pronotum 4.5, Hind femur 13.00

Distribution: India: Tamil Nadu.

Elsewhere: Malaysia and Malaya.

***Phlaeoba tenebrosa* (Walker, 1871)**

(Plate 16; Fig. 13)

Opomala tenebrosa Walker, F. 1871. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum Supplement*: 53

Phlaeoba tenebrosa Kirby, W.F. 1910. *A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae)* **3**(2): 138.

Phlaeoba tenebrosa (Walker); Uvarov. 1925[1924]. *Jour. Asiat. Soc. Bengal* **20**: 318.

Phlaeoba tenebrosa (Walker); Uvarov. 1929. *Revue Suisse de Zool.* **36**: 537.

Phlaeoba tenebrosa (Walker); Yin, Xiang-Chu, Kai-Ling Xia & *et al.* 2003. *Fauna Sinica, Insecta* **32**(supplement): 177.

Phlaeoba tenebrosa (Walker); Azim & Reshi. 2010. *Acta Zool. Mex.* (n.s.) **26**(1): 221.

Female genitalia: Supra-anal plate broad, as long as wide, apex pointed, cercus broad narrowing apically, slightly more than two times as long as wide, apex rounded. Sub genital plate wide, posterior margin slightly notched in the middle, setose medially, surface with brown patches, egg-guide, short, two times as long as wide, narrowing at apex. Spermatheca apical diverticulum long, broad, sac like. Pre-apical diverticulum short rudimentary. Ovipositor dorsal valve broad, apical tip rounded, dorsal condyle well developed, slightly shorter than lateral apodeme, ventral valve narrow, apical tip acute.

Material Examined: Arunachal Pradesh, East Siang, 2-II-2009 on grasses, 4♀♀.

Morphometry: (length in mm)

Female: Body length 27.8, Tegmina 24.4, Pronotum 5.5, Hind femur 15.9

Distribution: India: Arunachal Pradesh.

Genus *Orthochtha* Karsch, 1891

Orthochtha Karsch, 1891. *Berlin Ent. Z.* **36**(1): 177.

Type-species: *Chrysochraon dasycnemis* Gerstaecker, 1869.

Cymoctha Karsch, 1893: 54. (Uvarov, 1953, *Publ. cult. Comp. Diam. Angola* : 146).

Type -species: *Cymoctha nigricornis* Karsch, 1893.

Rasperpcta Sjostedt, 1931: 20. (Dirsh, 1958c. *Tijdschr. Ent.* : 60).

Type -species: *Rasperpcta ampla* Sjostedt, 1931.

Macrocymoctha Sjostedt, 1993: 22. (Kevan, 1956. *Ann. Mag. Nat. Hist.*: 31).

Type -species: *Macrocymoctha speciosa* Sjostedt, 1931.

Diagnosis: Body of median size; antennae ensiform, much longer than head and pronotum together; head conical, never elongate; fastigium of vertex depressed, with lateral carinulae; fastigial foveolae absent; frontal ridge sulcate; pronotum elongate, constricted in middle, median carina crossed by posterior transverse sulcus only, lateral carinae very slightly incurved; metazona much shorter than prozona, posterior margin obtuse angular; mesosternal interspace open,; medial area of tegmen with weak intercalary vein; hind femur moderately stout, extending beyond abdomen; arolium large.

The genus is represented by a single species from this region.

Orthochtha indica (Uvarov, 1942)
(Plate 17; Fig. 14)

Orthochtha indica Uvarov, 1942a: *Ann. Mag. nat. hist. London*, **9**(11) (56): 587.

Julka et al., 1982: *Oriental Insect*, **63**: 71.

Bhowmik & Halder, 1983b: *Rec. zool. Surv. India*, **81**(1&2): 171.

Bhowmik, 1985b: *Rec. zool. Surv. India, Occ. Pap. No.*, **78**: 12.

Hazra et al., 1995: State Fauna Series, 4: Fauna of Meghalaya, Part 3, *Zool. Surv. India,* : 239.

Saini & Mehta, 2007: *Bionotes*. 9(3): 76.

Male genitalia: Supra-anal plate elongate-angular, cercus narrow-conical; slightly incurved with obtuse apex, sub genital plate short, subconical; Epiphallus, bridge narrow medially, ancorae large, lophi lobiform; aedeagus, apical valve about as long as and much narrower than basal valve.

Female genitalia: Supra-anal plate broad, slightly broader than long, apex broadly rounded, cercus broad basally, narrowing apically, slightly longer than two times as long as wide, apex narrowly rounded. Sub genital plate elongate, wide, posterior margin smooth without setae, patches absent, egg-guide narrow, three times as long as wide, apex pointed. Spermatheca apical diverticulum elongate uniformly, narrowing apically, much longer than pre-apical diverticulum. Pre-apical diverticulum short, broad, sac like. Ovipositor broad with apex pointed, one and half time shorter than lateral apodeme, ventral valve elongate narrow, apical tip rounded.

Material Examined: Sikkim, Gangtok, Sichey, 14-X-2008, on grasses, 3♀♀, 2♂♂. Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 5♀♀, 2♂♂. Mizoram, Aizwal, Sihphir, 10-II-2009, on grasses, 7♀♀, 5♂♂.

Morphometry: (length in mm)

Male: Body length 23.9, Tegmina 20.64, Pronotum 1.84, Hind femur 16.14

Female: Body length 35.5, Tegmina 26.5, Pronotum 2.2, Hind femur 21.65

Distribution: India: Delhi, Himachal Pradesh, Maharashtra, Madhya Pradesh and Meghalaya.

SUBFAMILY OEDIPODINAE WALKER, 1871

Oedipodinae, Walker, F. 1871. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum Supplement*: 102.

Diagnosis: Body medium to large, rather sturdy; integument rather rugulose; frons usually vertical or nearly so; pronotum with median carina usually well developed, sometimes high, lateral carina absent or weak or partly developed; prosternal process absent; tegmina and wings fully developed; medial area of tegmen with intercalary vein, at least in male well developed, serrate forming the file of stridulatory mechanism; wings usually with a dark band; tympanum present; hind femur without stridulatory pegs on inner side, lower basal lobe shorter than upper one; arolium small.

Male cercus conical with rounded apex; epiphallus, bridge undivided; ancorae well developed, lophi large; aedeagus, basal and apical valve connected by flexure, basal valve with well developed gonopore process; spermatheca, apical diverticulum small or rudimentary, pre-apical diverticulum sac-like.

The subfamily Oedipodinae is represented by eight genera from this region. A key for their separation is given below:

Key to the genera of the subfamily Oedipodinae Walker, 1871

1. Pronotum with median carina crossed by two transverse sulci.....2

--- Pronotum with median carina crossed by one transverse sulcus or not crossed at all..... 3

2. Pronotum with median carina equally raised in prozona and metazoan, not forming tooth like projection..... ***Sphingonotus*** Fieber, 1852

--- Pronotum with median carina strongly raised in prozona forming two tooth like projections, sharp in metazoan ..... ***Trilophidia*** Stal, 1873

3. Pronotum with median carina well developed 4

--- Pronotum with median carina weak ..... ***Aiolopus*** Fieber, 1853

4. Pronotum with lateral carina weak or absent 5

--- Pronotum with lateral carina well developed ..... ***Ceracris*** Walker, 1870

5. Inner spur on inner side of hind tibia simple not much longer than external one; medial area of tegmina not specialized.....6

--- Inner spur on inner side of hind tibia much longer than external one, with small pre-apical projection; medial area of tegmina with dense, thickened, oblique, parallel veinlets . .....***Heteropternis*** Stal, 1873

6. Median carina of pronotum, in profile, excised at posterior sulcus.....7

--- Median carina of pronotum, in profile, not excised at posterior sulcus .... ***Dittopternis*** Saussure, 1884

7. Vertex at base of fastigium without median carinula; frons vertical ..... ***Chloebora*** Saussure, 1884

--- Vertex at base of fastigium with short longitudinal carinula; frons slightly oblique; epiphallus with large ancorae ..... ***Scintahrista*** Saussure, 1884

Genus *Sphingonotus* Fieber, 1852

Sphingonotus Fieber, 1852. *In Kelch. Grundlage zur Kenntnis der Orthopteren (Gradflügler) Oberschlesiens, und Grundlage zur Kenntnis der Käfer Oberschlesiens, erster Nachtrag (Schulprogr.). Ratibor* 2.

Type-species: *Gryllus Locusta cearulans* Linnaeus, 1767.

Vosseleriana Bei-Bienko, 1950: 202. Syn. by (Uvarov, 1954a. *Ent. Berl.*: 147).

Type-species: Not stated.

Diagnosis: Body small to medium size; antennae filiform, as long as head and pronotum together; fastigium of vertex slightly concave, with lateral carinulae, slightly sloping forward; frontal ridge flat; dorsum of pronotum saddle-shaped, longer than its width, constricted in prozona, median carina linear, equally raised in prozona and metazona, crossed by two transverse sulci, lateral carinae absent; metazona longer than prozona, posterior margin obtuse-angular; mesosternal interspace open; tegmina fully developed, apex narrow, median area with intercalary vein strongly serrated; hind tibia with inner pair of spurs slightly longer than external one, external apical spine absent;

arolium of small size. Male: supra-anal plate angular, cercus slightly incurved, with obtuse or rounded apex. Epiphallus with bridge narrow, ancorae large, lophi bilobate. Female: sub genital plate, posterior margin broadly rounded, setose; ovipositor, dorsal valve much shorter than lateral apodeme, dorsal condyle not prominent; spermatheca, apical diverticulum short, pre-apical diverticulum elongate and sac-like.

The genus is represented by two species from this region. A key for their separation is given below:

Key to the Indian species of the genus *Sphingonotus* Fieber, 1852

1. Tegmina brown, distinctly banded; wings tinted with pale blue ....*S. caerulans caerulans* Linnaeus, 1767

--- Tegmina brownish-testaceous, indistinctly banded; wings bluish basally ..... ***S. rubescens rubescens*** Walker, 1870

***Sphingonotus caerulans caerulans* (Linnaeus, 1767)**

(Plate 18; Fig. 15)

Gryllus (Locusta) caerulans Linnaeus, 1767. *Systema Naturae per Regna tria naturae* (12th ed.) **1**(2): 701.

Sphingonotus caerulans (Linnaeus); Walker, 1871. *Catalogue of the specimens of Dermaptera Saltatoria in the Collection of the British Museum*: 74.

Sphingonotus caerulans (Linnaeus); Kirby, 1914. *The Fauna of British India, including Ceylon and Burma*: 154.

Female genitalia: Supra-anal plate broader than long, apex rounded. Cercus narrowing apically, more than two times as long as wide, apex conical or conical apically. Sub genital plate with lateral margin straight, posterior margin wavy, concave medially. Egg-guide short, broad, as long as wide, jannone's organ present as two small spots. Spermatheca apical diverticulum moderately broad and sac like. Pre-apical

diverticulum moderately long and narrow. Ovipositor basal valve robust, one and half time shorter than lateral apodeme, apex pointed, ventral valve robust, apex bluntly rounded, basivalvular sclerite, elongate narrowing apically.

Material Examined: Arunachal Pradesh, Papumpare, Itanagar, 1-II-2009, on grasses, 9♀♀.

Morphometry: (length in mm)

Female: Body length 21.16, Tegmina 15.0, Pronotum 3.5, Hind femur 13.9

Distribution: India: Arunachal Pradesh.

Sphingonotus rubescens rubescens (Walker,1870)

(Plate 19; Fig. 16)

Oedipoda rubescens Walker, F. 1870. *Zoologist,* **25**(28): 2301.

Sphingonotus rubescens (Walker); Kirby, 1914. *The Fauna of British India, including Ceylon and Burma.*: 155.

Sphingonotus rubescens (Walker); Steinmann, 1968b. *Annls. Zool.*: 292.

Female genitalia: Supra-anal plate broad, much wider than long, apex blunt, cercus elongate narrow, narrowing apically, twice as long as wide, apex bluntly rounded. Sub genital plate, posterior margin broadly rounded, setose; spermatheca, apical diverticulum short, pre-apical diverticulum elongate and sac-like. ovipositor, dorsal valve much shorter than lateral apodeme, dorsal condyle not prominent.

Material Examined: Arunachal Pradesh, East Siang, Pasighat, 3-II-2009, on grasses, 7♀♀.

Morphometry: (length in mm)

Female: Body length 20.16, Tegmina 18.75, Pronotum 0.70, Hind femur 11.14

Distribution: India: Jammu and Kashmir.

Genus *Trilophidia* Stal, 1873

Trilophidia Stal, 1873. *Recencio Orthopterorum. Revue critique des Orthoptères décrits par Linné,* De Geer *et* Thunberg **1**:117, 131.

Type-species: (*Oedipoda cristella* Stal, 1860) = *Trilophidia annulata* (Thunberg, 1815).

Diagnosis: Body of small size; antennae filiform, slightly inflated in apical third, longer than head and pronotum together; head subconical; fastigium of vertex angular, concave, with truncate apex; frontal ridge sulcate; dorsum of pronotum tectiform, somewhat constricted in prozona, strongly tuberculated, median carina strongly raised forming two high tooth-like projections in prozona, in metazona sharp, crossed by two transverse sulci, lateral carinae irregular, forming small tooth-like lateral tubercles in front of first sulcus, strongly diverging and sometimes weak in metazona; metazona longer than prozona, posterior margin angular; mesosternal interspace open; tegmina and wings fully developed; medial area of tegmen with intercalary vein strong and finely serrated; hind femur moderately robust; hind tibia with inner spurs slightly longer than external one, external apical spine absent; arolium small.

The genus is represented by two species from this region. A key for their separation is given below:

Key to the Indian species of the genus *Trilophidia* Stal, 1873

1. Body of small size; inner side of hind femur with only one complete yellow band; basal disc of wings hyaline; hind tibiae with two narrow ochraceous rings ..... ***T. annulata*** Thunberg, 1815

--- Body of medium size; inner side of hind femur with two yellow band; basal disc of wings yellow; hind tibiae with two broad ochraceous rings ..... ***T. repleta*** Walker, 1870

Trilophidia annulata (Thunberg, 1815)

(Plate 20; Fig. 17)

Gryllus annulatus Thunberg, 1815, *Mem. Acad. Sci. St. petersberg*, **5**: 234.

Gryllus bidens Thunberg, 1815, *Mem. Acad. Sci. St. petersberg*, **5**: 235. Syn. by. Hollis, 1965, *Trans. R. ent. Spc. Lond.*, **117**: 251.

Epacromia turpis Walker, 1870. *Cat. Derm. Salt. Brit. Mus.* 775. Syn. by Hollis, 1965, *Trans. R. ent. Spc. Lond.*, **117**: 251.

Trilophidia annulata (Thunberg); Stal, 1873, *Recens. Orth.*, **1**: 132.

Trilophidia annulata (Thunberg); Hollis, 1965, *Trans. R. Entomol. Soc. London*: 251.

Male genitalia: Supra-anal plate broad, short, almost as long as wide, apex obtusely rounded; cercus broad, incurved, more than twice as long as wide, apex rounded. Sub genital plate broad, longer than wide, apex obtusely conical. Epiphallus with narrow bridge, ancorae short with rounded apices, lophi large and bilobed and posterior lobes with a shallow excavation. Hollis (1965) separated this species from *T. conturbata* and *T. cinnabarina* on the basis of epiphallus. Aedeagus flexured, apical valve narrow, straight, much narrower and much shorter than basal valve, apex pointed; basal valve broad medially.

Female genitalia: Supra-anal plate wide, flattened, wider than long, apex obtusely conical; cercus short, broad, longer than broad, apex rounded. Sub genital plate with posterior margin semicircular; posterior marginal setae and jannone's organs present; egg-guide broad, less than twice as long as wide. Spermatheca with apical diverticulum short and tubercle-like, pre-apical diverticulum well developed, moderately broad and curved. Ovipositor with dorsal valve moderately broad, slightly more than three times as long as wide, slightly shorter than lateral apodeme, apical tip short and blunt, dorsal condyle not much prominent; ventral valve with apical tip short and blunt, basal sclerite well developed, tuberculate apically.

Material Examined: Meghalaya, William Nagar, East Garo hills, 16-I-2011, on grasses, 3♀♀. Assam, Guwahati, Sansari, 29-X-2008, on grasses, 4♀♀, 1♂. Assam, Nalbari, 25-X-2009, on grasses, 5♀♀, 2♂♂. Arunachal Pradesh, West Siang, Along, 31-I-2009, on grasses, 7♀♀, 3♂♂; 2-II-2009, on grasses, 8♀♀, 5♂♂; 4-II-2009, on grasses, 4♀♀. Mizoram, Aizwal, Selesih, 8-II-2009, on grasses, 7♀♀, 3♂♂; 11-II-2009, on grasses, 4♀♀. Manipur, West Imphal, 15-X-2009, on grasses, 5♀♀, 2♂♂. Nagaland, Dimapur, 19-X-2009, on grasses, 6♀♀, 3♂♂.

Morphometry: (length in mm)

Male: Body length 15.84, Tegmina 18.3, Pronotum 0.94, Hind femur 11.25

Female: Body length 21.5, Tegmina 21.15, Pronotum 1.16, Hind femur 12.21

Distribution: India : Goa, Tamil Nadu, Uttar Pradesh and Kerala.

***Trilophidia repleta* (Walker, 1870)**

(Plate 21; Fig. 18)

Epacromia repleta Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 770.

Trilophidia antennata Krauss. 1877. *S.B. Akad. Wiss. Wien, Math.-Nat. Kl.* (Abt. 1) **76**(1): 57. Syn. by Uvarov. 1925[1924]. *Trans. Entomol. Soc. London* 3-4:279

Trilophidia repleta (Walker); Uvarov. 1925. *Trans. Entomol. Soc. London* **3-4**: 279.

Trilophidia repleta (Walker); Hollis. 1965. *Trans. R. Entomol. Soc. London* **117**: 245.

Female genitalia: Supra-anal plate short, broad, as long as wide, lateral margins broadly circular, apex bluntly rounded, cercus, short, broad and narrowing apically, one and half times as long as wide, apex bluntly rounded. Sub genital plate, posterior margin semicircular, setose; spermatheca, apical diverticulum short, pre-apical diverticulum broad and sac-like. ovipositor, dorsal valve slightly shorter than lateral apodeme.

Material Examined: Arunachal Pradesh, East Siang, Pasighat, 4-II-2009, on grasses, 8♀♀.

Morphometry: (length in mm)

Female: Body length 20.88, Tegmina 22.2, Pronotum 1.05, Hind femur 13.12

Distribution: India: Arunachal Pradesh.

Genus *Aiolopus* Fieber, 1853

Aiolopus Fieber, 1853. *Lotos* **3**: 100.
Type-species: *Gryllus thalassinus* Fabricius, 1781.
Epacromia Fischer, 1853: 296. Syn. by (Uvarov, 1942a. *Trans. Am. Ent. Soc.*, 336).
Aiolopus Kirby, 1910: 120. Syn. by (Harz, 1975. *The Orthoptera of Europe*: 550).
Type-species: *Gryllus thalassinus* Fabricius, 1781.
Aeloptilus Bei-Bienko, 1966: 1793. Syn. by (Harz, 1975. *The Orthoptera of Europe*: 550).
Type-species: *Aeloptilus carinatus* Bei-Bienko, 1966.

Diagnosis: Body of medium size; antennae filiform, as long as or longer than head and pronotum together; fastigium of vertex elongate-angular, slightly concave, with well developed lateral carinulae; frons oblique; frontal ridge flat; pronotum slightly tectiform and slightly constricted in prozona, median carina weak, crossed by posterior transverse sulcus only, lateral carinae absent; metazona distinctly longer than prozona, posterior margin obtuse-angular; mesosternal interspace open; tegmina and wings fully developed; medial area of tegmen with intercalary vein well developed and finely serrated; hind femur slender; hind tibia with inner pair of spines longer than external one, external apical spine absent; arolium of small size. Male: supra-anal plate elongate-angular, cercus narrow conical with obtuse apex; sub genital plate short, subconical, with obtuse apex; Epiphallus, bridge undivided medially, ancorae curved

and lophi bilobate; aedeagus, apical valve much shorter and narrower than basal valve. Female: sub genital plate, posterior margin broadly rounded, setose; ovipositor, dorsal valve shorter than lateral apodeme, dorsal condyle indistinct; spermatheca, apical diverticulum short, pre-apical diverticulum broad and sac like.

The genus is represented by two species from this region. A key for their separation is given below:

Key to Indian subspecies of *Aiolopus thalassinus* Fieber, 1853

1. Frontal ridge gradually tapered towards the fastigium; foveolae longer; hind tibia in the basal third with a straw-coloured band, in the median part usually bluish, the apical part reddish ..... ***A. t. tamulus*** Fabricius, 1781

--- Frontal ridge of uniform width with nearly parallel margins; foveolae shorter; hind tibia coloured as in *tumulus* but with a dark ring before the middle and without the bluish median part ..... ***A. t. thalassinus*** Fabricius, 1798

***Aiolopus thalassinus thalassinus* (Fabricius, 1781)**

(Plate 22; Fig. 20)

Gryllus thalassinus Fabricius., 1781. *Species Insectorum* **1**: 367.

Gryllus prasinus Thunberg, 1815. *Mem. Acad. Imp. Sci. St. Peterburg* **5**: 239. Syn. by Hollis. 1968. *Bull. Br. Mus. (Nat. Hist.) Ent.* **22**(7): 327.

Acridium grossum Costa, O.G. 1836. *Fauna del regno di Napoli. Ortotteri* 25. Syn. by Hollis. 1968. *Bull. Br. Mus. (Nat. Hist.) Ent.* **22**(7): 340.

Acridium laetum Brullé, 1840. *In Webb, P.B. & Berthelot. Histoire naturelle des Iles Canaries* **2**(2): 77. Syn. by Kirby, William Forsell. 1910. *A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae)* **3**(2): 191.

Epacromia angustifemur Ghiliani, 1869. *Ann. Soc. Entom. Belgique* 12 C.R.: 179 or 218. Syn. by Johnston, Henry Bennett. 1956. *Annotated catalogue of African grasshoppers*, 507.

Ochrophlebia savignyi Krauss, 1890. *Zoologische Jahrbücher. Abt. Syst. Geogr. und Biol. der Tiere* **5**(2): 262.

Aiolopus thalassinus kivuensis Sjöstedt, 1923. *Ark. Zool.* **15**(6): 18. Syn. by Johnston, Henry Bennett. 1956. *Annotated catalogue of African grasshoppers*, 509.

Aiolopus thalassinus (Fabricius); Bei-Bienko & Mishchenko, 1951. *Locusts and Grasshoppers of the U.S.S.R. and Adjacent Countries* **2**: 568[211].

Aiolopus acutus Uvarov, 1953. *Publ. Cult. Comp. Diamant. Angola* **21**: 111. Syn. by Hollis. 1968. *Bull. Br. Mus. (Nat. Hist.) Ent.* **22**(7): 340.

Aiolopus thalassinus (Fabricius); Harz, 1975. *The Orthoptera of Europe*: 554.

Male genitalia: Supra-anal plate broadly angular, rounded, lateral margins curved medially, apex rounded; cercus elongate-conical, almost twice as long as wide with obtuse apex. Sub genital plate broad, almost as long as wide, apex obtusely conical. Epiphallus with bridge moderately narrow, undivided; ancorae moderately broad, curved and pointed at tips; lophi lobiform, lateral plates and their anterior projections well developed. Aedeagus with apical valve narrow, curved, much narrower and shorter than basal valve; connected with basal valve by flexure, apex blunt; basal valve much broader basally.

Female genitalia: Supra-anal plate slightly longer than wide, apex obtusely rounded; cercus broad with blunt apex.; Sub genital plate with posterior margin wavy, setose marginally; egg-guide broad basally and narrowing apically, less than two and a half times as long as wide. Spermatheca with apical diverticulum short and tubercle-like; pre-apical diverticulum well developed and sac like. Ovipositor with dorsal valve elongate, slender, slightly more than three times as long as wide, shorter than lateral apodeme, dorsal condyle distinct, apex blunt, ventral valve with pointed tip.

Material Examined: Arunachal Pradesh, Lohit, Tezu, 5-II-2009, on grasses, 4♀♀, 2♂♂.

Morphometry: (length in mm)

Male: Body 16.89, Tegmina 19.79, Pronotum 0.85, Hind femur 11.69

Female: Body 21.56, Tegmina 24.41, Pronotum 1.36, Hind femur 13.69

Distribution: India: Arunachal Pradesh.

Aiolopus thalassinus tamulus (Fabricius, 1798)

(Plate 23; Fig. 19)

Gryllus tamulus Fabricius, 1798. *Supplementum Entomologiae Systematicae Suppl*: 195.

Gryllus dorsalis Thunberg, 1815. *Mem. Acad. Imp. Sci. St. Peterburg* **5**: 229.

Aiolopus tamulus Bei-Bienko & Mishchenko, 1951. *Locusts and Grasshoppers of the U.S.S.R. and Adjacent Countries* **2**: 568[211].

Male genitalia: Supra-anal plate slightly longer than wide, lateral margins diverging posteriorly, apex conically rounded. Cercus elongated, more than two times as long as wide, apex rounded. Sub genital plate lateral margin converging posteriorly, forming triangle, apex bluntly rounded. Epiphallus bridge shaped, bridge moderately narrow, ancorae short, conical, apex lophi well developed, dumble shaped, lateral plates parallel. Aedeagus apical valve narrow, much shorter than basal valve, pointed apically, basal valve broad, sac like.

Material Examined: Assam, Jorhat, Jorhat, 13-II-2011, on grasses, 5♂♂.

Morphometry: (length in mm)

Male: Body 20.9, Tegmina 20.1, Pronotum 5.3, Hind femur 10.5

Distribution: India: Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Bihar, Chattisgarh, Delhi, Haryana, Himachal Pradesh, Karnataka, Kerala and Madhya Pradesh.

Elsewhere: Australia, Bangladesh, Borneo, Celebs, China, Hainan, Hong Kong, Pakistan, Sri Lanka and Taiwan.

Genus *Ceracris* Walker, 1870

Ceracris Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 721, 790.

Type-species: *Ceracris nigricornis* Walker, 1870.

Diagnosis: Body small to medium size; antennae slightly flattened at basal half, as long as or slightly longer than head and pronotum together; head normal, never elongate; fastigium of vertex concave with strong lateral carinulae; fastigial foveolae absent; frons oblique; frontal ridge flat, parallel above the ocellus, slightly divergent below the ocellus; pronotum elongate, slightly constricted in middle, median carina crossed by posterior transverse sulcus only, lateral carinae diverging in metazona; metazona shorter than prozona, posterior margin obtusely angular; prosternal process absent; mesosternal interspace open; tegmina and wings well developed, medial area of tegmen with indistinct intercalary vein; hind femora short and stout; arolium of medium size; abdomen with a very strongly raised median carina. Male: supra anal plate broad, triangular, cercus slightly conical and curved, with obtuse apex; subgenital plate short, truncate at apex. Female: subgenital plate, posterior margin weakly trilobite, setose; ovipositor, dorsal valve shorter than lateral apodeme, apical tips blunt; spermatheca, apical diverticulum short, apex truncate, pre-apical diverticulum long and broad, much longer than apical diverticulum.

The genus is represented by two species from this region. A key for their separation is given below:

Key to the Indian species of the genus *Ceracris* Walker, 1870

1. Hind tibiae completely blue beyond the yellow ring near the base .... ***C. deflorata*** Brunner, 1893

— Hind tibiae varied with black and yellow beyond the yellow ring near the base ..... ***C. nigricornis*** Walker, 1870

Ceracris deflorata **(Brunner, 1893)**

(Plate 24; Fig. 21)

Duronia deflorata Brunner von Wattenwyl, 1893: *Ann. Mus. Civ. Stor. Nat. Giacomo Doria Genova, Ser 2,* **13**(33): 126.

Male genitalia: Supra-anal plate broad, slightly longer than wide, apex broadly rounded, cercus broad basally, narrowing apically, more than two times as long as wide, apex rounded. Sub genital plate long broad, apex narrowing pointed. Epiphallus bridge shaped, bridge narrow, ancorae well developed with tips pointed, lophi developed. Aedeagus, basal valve broad, slightly shorter than apical valve. Apical valve elongate narrow, downcurved with pointed tips.

Female genitalia: Supra-anal plate broad, wider than long, apex pointed, cercus broad basally and narrowing apically, two times as long as wide, apex narrowly rounded. Sub genital plate broad, posterior margin smooth without setae, surface with two brown patches, egg-guide broad basally and narrowing apically, twice as long as wide. Spermatheca elongate, long, broad, sac like. Pre-apical diverticulum short and broad. Ovipositor dorsal valve broad, apical tip acutely rounded, slightly shorter than lateral apodeme, ventral valve elongate narrow with apical tip pointed.

Material Examined: Sikkim, Gangtok, Ranka, 14-X-2008, on grasses, 7♀♀, 5♂♂.

Morphometry: (length in mm)

Male: Body length 11.9, Tegmina 15.00, Pronotum 4.5, Hind femur 11.6

Female: Body length 29.4, Tegmina 20.00, Pronotum 6.4, Hind femur 18.5

Distribution: India: Bihar, Himachal Pradesh and Manipur.

Elsewhere: Myanmar.

Ceracris nigricornis Walker, 1870

(Plate 25; Fig. 22)

Ceracris nigricornis Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 791.

Duronia versicolor Brunner von Wattenwyl. 1893. *Ann. Mus. Civ. Stor. Nat. Genova* **2** **13**(33): 126.

Female genitalia: Supra-anal plate triangular as long as wide, apex rounded, cercus broad basally, narrow apically, slighter less than twice as long as wide, apex bluntly rounded. Sub genital plate with posterior margin slightly convex in middle; posterior marginal setae and Jannone's organs present; egg-guide slightly more than twice as long as wide. Spermatheca with apical diverticulum short, apex truncated; pre-apical diverticulum long and broad, much longer than apical diverticulum. Ovipositor with dorsal valve four times as long as wide, shorter than lateral apodeme, apical tip blunt, dorsal edge smooth; ventral valve with apical tip long and pointed, slope deeply concave, basal sclerite narrow and punctate.

Material Examined: Meghalaya, Shillong, Lumdaitkhla, 25-X-2008, on grasses, 2♀♀.

Morphometry: (length in mm)

Female: Body length 36.72, Tegmina 27.1, Pronotum 2.41, Hind femur 20.18

Distribution: India: Arunachal Pradesh, Himachal Pradesh, Sikkim and West Bengal.

Elsewhere: Mayanmar.

Genus *Heteropternis* Stal, 1873

Heteropternis Stal, 1873. *Recencio Orthopterorum. Revue critique des Orthoptères décrits par Linné*, De Geer et Thunberg 1:177, 128.

Type-species: *Heteropternis pyrrhoscelis* Stal, 1873.

Thaleius Finot, 1908: 27. Syn. by (Uvarov, 1954b. *Bull. Soc. Ent. Fr.*: 127).

Type-species: *Thaleius lemagneni* Finot, 1908.

Diagnosis: Body of medium size; antennae filiform, as long as or longer than head and pronotum together; fastigium of vertex angular, flat, slightly concave, with lateral carinulae; frons vertical; frontal ridge constricted at apex, depressed at ocellus; pronotum slightly tectiform, median carina sharp, crossed by posterior transverse sulcus only, lateral carinae indistinct; metazona longer than prozona, posterior margin acute-angular; mesosternal interspace open; tegmina and wings fully developed; medial area of tegmen widened, with dense, thickened, oblique, parallel veinlets, intercalary vein finely serrated; apical part of tegmina with transverse veins erect; hind femur robust; hind tibia with inner spurs of inner side much longer than external one, with small pre-apical projection, external apical spine absent; arolium of medium size. Male: supra-anal plate angular, cercus narrow-conical, with obtuse apex; subgenital plate conical with obtuse or subacute apex; Epiphallus; bridge short, ancorae moderately small, lophi bilobate; aedeagus, apical valve much shorter and narrower than basal valve. Female: sub genital plate, posterior margin broadly rounded, setose; ovipositor, dorsal valve slightly shorter than lateral apodeme; spermatheca, apical diverticulum rudimentary, pre-apical diverticulum sac-like.

The genus is represented by a single species from this region.

***Heteropternis respondens* (Walker, 1859)**

(Plate 26; Fig. 24)

Acrydium respondens Walker, F. 1859. *Ann. Mag. nat. Hist.* **34:** 223.

Heteropternis respondens (walker); Kirby, W.F. 1914. *Fauna of British India, including Ceylon and Burma.* Orthoptera (Acrididae) 141.

Heteropternis respondens (walker); Bei-Bienko & Mishchenko. 1951. *Locusts and Grasshoppers of the U.S.S.R. and Adjacent Countries* **2:** 573[216].

Male genitalia: Supra-anal plate broadly angular, conical cercus, with subacute apex. Sub genital plate conical with obtuse or subacute apex. Epiphallus, undivided bridge, broad, anterior process oval, posterior process bilobed, lateral process with irregular margin, wavy, lophi broad and more or less kidney shaped with stalk. Both lophi are entangled with the inner part of the posterior process; Aedeagus with apical valve narrower and much shorter than basal valve, basal valve broad.

Female genitalia: Supra-anal plate slightly longer than wide, apex obtusely rounded; cercus broad with blunt apex; Sub genital plate with posterior margin slightly wavy, broadly rounded, egg-guide uniformly broad, almost two times as long as wide; Spermatheca, apical diverticulum rudimentary, pre-apical diverticulum sac-like. Ovipositor with dorsal valve elongate, slender, weakly curved, more than three times as long as wide, shorter than lateral apodeme, ventral valve curved, apical tip pointed, basal sclerite broad and smooth.

Material Examined: Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 2♀. Mizoram, Aizwal, Selesih, 8-II-2009, on grasses, 8♀♀, 5♂♂. Manipur, East Imphal, 17-X-2009, on grasses, 4♀♀.

Morphometry: (length in mm)

Male: Body length 18.12, Tegmina 21.05, Pronotum 1.72, Hind femur 12.67

Female: Body length 26.7, Tegmina 25.23, Pronotum 02.4, Hind femur 15.45

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Bihar, Himachal Pradesh, Karnataka, Meghalaya, Nagaland, Orissa, Sikkim, Uttar Pradesh and West Bengal.

Elsewhere: Bangladesh, China, Indonesia, Japan, Java, Malaysia, Myanmar, Nepal and Sri Lanka.

Genus *Dittopternis* Saussure, 1884

Dittopternis Saussure, 1884. *Mem. Soc. Phys. Hist. Nat. Geneve* **28**(9): 52, 125.
Type-species: *Dittopternis ceylonica* Saussure, 1884.

Diagnosis: Body of medium size; antennae filiform, longer than head and pronotum together; fastigium of vertex longer than broad, concave, with lateral carinulae; frons vertical; frontal ridge sulcate; pronotum granulose, dorsum tectiform, median carina sharp, deeply crossed by posterior transverse sulcus only, lateral carinae indistinct; metazona longer than prozona, posterior margin acute-angular; mesosternal interspace open; tegmina and wings fully developed; medial area of tegmen with intercalary vein serrated; apical part of tegmina with transverse veins erect; hind femur thick, upper margin denticulated; hind tibia with inner spur of inner side slightly longer than external one, external apical spine absent; arolium of small size. Male: supra-anal plate triangular, cercus conical, with obtuse apex; epiphallus, bridge short, undivided, ancorae moderately large, lophi bilobate; aedeagus, apical valve much shorter and narrower than basal valve. Female: subgenital plate, posterior margin semicircular, setose; ovipositor, dorsal valve slightly shorter than lateral apodeme, apical tip blunt; spermatheca, apical diverticulum short, pre-apical diverticulum broad and sac-like.

The genus is represented by a single species from this region.

Dittopternis venusta (Walker, 1870)

(Plate 27; Fig. 25)

Oedipoda venusta Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 740.

Dittopternis venusta (walker); Kirby, W.F. 1914. *Fauna of British India, including Ceylon and Burma.* Orthoptera (Acrididae) 140.

Male genitalia: Supra-anal plate triangular, cercus short, broad basally, apex narrow, acute and slightly incurved. Sub genital plate broad, lateral margins straight, setose apically. Epiphallus, bridge undivided; anterior process inwardly round. Posterior process broad and blunt, lophi more or less bean shaped with stalk. Ancorae hooked and pointed inwards; aedeagus with apical valve uniformly broad, narrower and shorter than basal valve.

Female genitalia: Supra-anal plate broader than long, apex rounded. Cercus narrowing apically, more than two times as long as wide, apex conical or conical apically. Sub genital plate, posterior margin semicircular, setose. Spermatheca, apical diverticulum short, pre-apical diverticulum broad and sac-like. Ovipositor, dorsal valve three times as long as wide, slightly shorter than lateral apodeme, apical tip curved and blunt, ventral valve curved, apical tip acute, basal sclerite broad and smooth.

Material Examined: Arunachal Pradesh, Anini, Dibang valley, 6-II-2009, on grasses, 9♀♀, 5♂♂. Manipur, Thoubal, 17-X-2009, on grasses, 4♀♀, 3♂♂.

Morphometry: (length in mm)

Male: Body length 21.00, Tegmina 21.62, Pronotum 1.90, Hind femur 13.24

Female: Body length 25.25, Tegmina 24.24, Pronotum 2.12, Hind femur 15.48

Distribution: India: Andhra Pradesh, Chattisgarh, Karnataka, Madhya Pradesh, Manipur, Meghalaya, Orissa, Tamil Nadu, Tripura and West Bengal.

Genus *Chloebora* Saussure, 1884

Chloebora Saussure, 1884. *Mem. Soc. Phys. Hist. Nat. Geneve* **28**(9): 54, 132.
Type-species: *Chloebora grossa Saussure*, 1884.
Pycnoderus Uvarov, 1941b: 61. Syn. by (Dirsh, 1958c. *Tijdschr. Ent.*: 56).
Type-species: *Pycnoderus sanguinipes* Uvarov, 1941.

Diagnosis: Body medium to large size; antennae filiform, about as long as or longer than head and pronotum together; fastigium of vertex sloping forward, concave, with lateral carinulae, apex truncate; frons vertical; frontal ridge wide, flat: pronotum granulose and slightly tectiform, constricted in prozona, median carina raised, excised at posterior transverse sulcus, lateral carinae absent; metazona slightly longer than prozona, posterior margin acute-angular; mesosternal interspace open, much wider than long; tegmina and wings fully developed; medial area of tegmen with intercalary vein strongly serrated, apical part with transverse veins erect; hind femur slender; hind tibia with inner pair of spurs slightly longer than external one, external apical spine absent; arolium of small size.

The genus is represented by a single species from this region.

***Chloebora marschalli* (Henry, 1933)**

(Plate 28; Fig. 23)

Scintharista marshalli Henry, 1933. *Spolia Zeylanica* **17**(3): 166.
Chloebora grossa Bolivar, 1902. *Ann. Soc. ent. Fr.* **70**: 604.
Chloebora marshalli Uvarov, 1941. *Ann. Mag. nat. Hist.* **118**: 300.

Male genitalia: Supra-anal plate elongate-angular; cercus narrow conical, with obtuse apex; Sub genital plate lateral margins diverging, central margin narrowing apically, apex rounded, entire margin setose. Epiphallus with bridge short, ancorae small with pointed tip, lophi bilobate; aedeagus with apical valve short and narrow, much shorter than basal valve.

Material Examined: Mizoram, Serchip, 8-II-2009, on grasses, 7♂♂.

Morphometry: (length in mm)

Male: Body length 19.00, Tegmina 22.67, Pronotum 2.23, Hind femur 13.24

Distribution: India: Tamil Nadu, Bihar and Orissa.

Elsewhere: Sri lanka.

Genus *Scintharista* Saussure, 1884

Scintharista Saussure, 1884. *Mem. Soc. Phys. Hist. Nat. Geneve* **28**(9): 51.

Type-species: *Scintharista brunneri* Saussure, 1884.

Conistica Saussure, 1884: 135. Syn. by (Dirsh, 1958c. *Tijdschr. Ent.*: 56).

Type-species: *Oedipoda saucia* Stal, 1873.

Quiroguesia I. Bolivar, 1886: 515. Syn. by (Uvarov, 1922e. *J. Bombay nat. Hist. Soc.*: 360).

Type-species: *Acridium miniatum* Brulle, 1840.

Diagnosis: Body of medium size; antennae filiform, slightly longer than head and pronotum together; vertex with short median carinula; fastigium of vertex elongate, concave, with obtuse apex and low lateral carinulae; frons oblique; frontal ridge moderately wide, shallowly sulcate; pronotum low-tectiform, slightly constricted in prozona, median carina moderately high, excised at posterior transverse sulcus; metazona slightly longer than prozona, posterior margin obtuse-angular; mesosternal interspace open; tegmina fully developed, medial area with intercalary vein strongly serrated, apical part with transverse veins erect; wings fully developed, brightly coloured, with dark fascia; hind femur slender; hind tibia with spurs not specialized, external apical spine absent; arolium of small size.

The genus is represented by a single species from this region.

Scintharista notabilis (Walker, 1870)

(Plate 29; Fig. 26)

Oedipoda notabilis Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 605-801.

Oedipoda brullei Saussure. 1884. *Mem. Soc. Phys. Hist. Nat. Geneve* **28**(9): 148. Syn. by Johnston, Henry Bennett. 1956. *Annotated catalogue of African grasshoppers*, 578.

Scintharista notabilis (Walker); Bei-Bienko & Mishchenko, 1951. *Akad. Nauk SSSR, Moscow*: 225).

Male genitalia: Supra-anal plate with angular apex; cercus broad basally, curved, narrowing apically with obtuse apex; Sub genital plate broad, lateral margins straight, setose apically. Epiphallus, bridge uniformly broad, undivided, ancorae comparatively large and lophi bilobate. Aedeagus with apical valve long, curved and much longer than basal valve.

Material Examined: Tripura, South Tripura, Udaipur, 16-II-2009, on grasses, 5♂♂.

Morphometry: (length in mm)

Male: Body length 20.88, Tegmina 22.2, Pronotum 1.05, Hind femur 13.12

Distribution: India: Himachal Pradesh, Punjab and Rajsthan.

Elsewhere: Afghanistan, Baluchistan and Iran.

SUBFAMILY OXYINAE BRUNNER, 1893

Oxyinae, Brunner von Wattenwyl. 1893. *Ann. Mus. Civ. Stor. Nat. Genova* **213**(33): 1-230.

Diagnosis: Body small to medium size; pronotum cylindrical or weakly flattened, median carina weak or absent, lateral carinae absent; prosternal process present; mesosternal interspace open and usually longer than wide; tegmina and wings fully

developed, reduced or absent; radial area of tegmina usually without series of regular, parallel transverse stridulatory veinlets; tympanum present; hind femur with lower basal lobe shorter than upper one, lower genicular lobe produced posteriorly into a spine; hind tibia usually expanded in apical half or third, external apical spine usually present; arolium large; apical abdominal sternites with tuft of short hairs; male cercus usually conical.

Male cercus usually conical, epiphallus bridge divided medially, ancorae present or absent, lophi present; aedeagus, basal and apical valves flexure, basal valve with gonopore process; female ovipositor, valves serrate or spined; spermatheca, pre-apical diverticulum broadly tubular and curved, longer than apical diverticulum.

The subfamily is represented by six genera from this region. A key for their separation is given below:

Key to the genera of the subfamily Oxyinae Brunner, 1893

1. Tegmina without series of regular, parallel transverse stridulatory veinlets on radial area; female ovipositor valves long and slender; male epiphallus with indistinct or short ancorae 2
--- Tegmina with series of regular, parallel transverse stridulatory veinlets on radial area; female ovipositor valves short; male epiphallus with long ancorae ..... ***Gesonula*** Uvarov, 1940.
2. Hind tibia expanded in apical half 3
--- Hind tibia not expanded in apical half; male epiphallus with ancorae ..... ***Caryanda*** Stal, 1878
3. Fully winged or brachypterous species 4
--- Micropterous species; 5
4. In male 10th abdominal tergite with fercula ..... ***Pseudoxya*** Yin & Liu, 1987
--- In male 10th abdominal tergite without fercula ..... ***Oxya*** Serville, 1831

5. In male 10th abdominal tergite without fercula ..... ***Cercina*** Stal, 1878

--- In male 10th abdominal tergite with fercula ..... ***Lemba*** Huang, 1983

Genus *Gesonula* Uvarov, 1940

Gesonula Uvarov, 1940. *Ann. Mag. nat. Hist.* **115**: 174.

Type-species: *Acridium punctifrons* Stal, 1878.

Gesonia Stal, 1878: 46. (Preoccupied by Gesonia Walker, 1858: 75, in Lepidoptera)

Type-species: *Acridium punctifrons* Stal, 1878.

Gesonula Uvarov, 1940a: 174. (Replacement name for Gesonia Stal, 1878).

Diagnosis: Body of medium size; antennae filiform, slightly longer than head and pronotum together; head conical; fastigium of vertex parabolic, without mid-longitudinal carinula; frontal ridge sulcate; dorsum of pronotum flattened, shallowly crossed by three transverse sulci, median carina weak, lateral carinae absent; metazona shorter than prozona, posterior margin broadly rounded; prosternal process conical with rounded apex; mesosternal interspace open; tegmina and wings fully developed, radial area of tegmina with series of regular, parallel transverse stridulatory veinlets; hind femur slender with lower genicular lobe spined; hind tibia expanded in apical half, external apical spine present. Male: supra anal plate subtriangular, apex spatulate, cercus long and conical; subgenital plate short and conical, apex obtuse; epiphallus, bridge narrow and divided medially, ancorae long and slender, lophi bilobate; aedeagus,apical valve narrower and shorter than basal valve. Female genitalia: subgenital plate, posterior margin serrate and convex medially, setae absent, egg-guide short and sculptured; ovipositor, valves short with acute dents, apical tips pointed, dorsal valve much shorter than lateral apodeme; spermatheca, apical diverticulum short and broad, pre-apical diverticulum long, tubular and recurved apically.

The genus is represented by a single species from this region.

***Gesonula punctifrons* (Stal, 1861)**

(Plate 30; Fig. 28)

Acridium (Oxya) punctifrons Stal, 1861. *Kongliga Svenska fregatten Eugenies Resa omkring jorden under befäl af C.A. Virgin åren* 1851-1853 (Zoologi) **2**(1): 336.

Heteracris tenuis Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 647, 668. Syn. by Bolívar, Ignacio. 1918. *Trab. Mus. Cienc. nat., Madrid (Ser. zool.)* **34**:14.

Oxya punctifrons (Stal); Stal, 1878. *Bihang Kungl. Svenska Vet. Akad. Handl.* **5**(4): 47.

Gesonula punctifrons (Stal); Mishchenko, 1952. *Fauna of Russia* **4**(2): 144.

Male genitalia: Cerci simple, spine like and incurved, supra-anal plate triangular, oval, the groove of which tubular in shape, large anterior process diverged, tip more or less rounded. Posterior process with a notch like structure, below of which bilobed structure present. The upper lobe connected with a membrane. Sub genital plate broad, lateral margin straight, narrowing apically, apex rounded, setose confined to apical margin. Epiphallus bridge undivided, short, broad, anchorae broad basally, narrowing apically, apex pointed, lophi well developed lobiform. Aedeagus apical valve short narrow, much shorter than basal valve, apex pointed, basal valve broad uniformly.

Female genitalia: Supra-anal plate elongate narrow, one and half times as long as wide, apex rounded, cercus broad basally, narrowing apically, two times as long as wide, apex blunt. Sub genital plate elongate, lateral margins diverging, central margin semi-circular, setae confined, in the middle egg-guide short, elongate narrow, twice as long as wide, apex pointed, jannone's organ present. Spermatheca apical diverticulum short, broad, apex curved and rounded, pre-apical diverticulum moderately broad, much longer than apical diverticulum. Ovipositor broad, robust, large. Upper one is moderately enlarged, tip end with a large upcurved spine. But the lower valve which is

narrower less widened tip of the valve with a large spine which is directed downwards, rest spines in the both valves uniform.

Material Examined: Assam, Guwahati, Bongra, 28-X-2008, on paddy field, 7♂♂, 12♀♀. Assam, Tezpur, 7-II-2011, on grasses, 5♂♂, 8♀♀. Manipur, East Imphal, 16-X-2009, on grasses, 4♀♀, 3♂♂. Nagaland, Dimapur, 19-X-2009, on grasses, 3♀♀, 2♂♂.

Morphometry: (length in mm)

Male: Body length 18.06, Tegmina 18.58, Pronotum 1.35, Hind femur 10.30.

Female:Body length 2.0, Tegmina 18.7, pronotum 4.0, , Hind femur 12

Distribution: India: Andman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chattisgarh, Delhi, Goa, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal.

Elsewhere: Bangladesh, Borneo, China, Hainan, Japan, Java, Kalimantan, Malacca, Myanmar, North Vietnam, Philippines, Sri Lanka, Taiwan, Thailand and Tongking.

Genus *Oxya* Serville, 1831

Oxya Serville, 1831. *Ann. Sci. nat.* **22**(86): 264, 286.

Type-species: *Oxya hyla* Serville, 1831.

Zulua Ramme, 1929: 327. (Hollis), 1975. *Bull. Br. Mus. Nat. Hist.* (*Ent.*), 220.

Type-species: *Zulua glabra* Ramme, 1929.

Diagnosis: Body of medium size; antennae filiform, longer than, as long as, or shorter than head and pronotum together; fastigium of vertex short, without mid-longitudinal carinula; frontal ridge sulcate; dorsum of pronotum slightly flattened, crossed by three transverse sulci, median carina weak, lateral carinae absent; metazona shorter than prozona, posterior margin rounded or obtusely angular; prosternal process conical with

rounded or subacute apex, often slightly bent backwards; mesosternal interspace open; tegmina fully developed or shortened, radial area without series of regular, parallel transverse stridulatory veinlets; hind femur slender with lower genicular lobe spined; hind tibia expanded in apical half, external apical spine present. Male: supra anal plate subtriangular, apex rounded or angular, cercus simple or compressed; subgenital plate short and conical, apex obtuse or weakly truncate; epiphallus: bridge divided medially, ancorae small or absent, lophi bilobate; aedeagus, apical valve as long as and narrower than basal valve. Female: subgenital plate, posterior margin often with denticles, setae absent, egg-guide finely ridged, broad at base and slender apically; ovipositor, valves long and slender, serrated, toothed or spined, dorsal valve much longer than lateral apodeme; spermatheca, pre-apical diverticulum tubular and longer than apical diverticulum.

The genus is represented by five species from this region. A key for their separation is given below:

Key to the species of the genus *Oxya* Serville, 1831

1. Posterior ventral basivalvular sclerites of ovipositor with one or two tooth like spines on its inner ventral margin 2
--- Posterior ventral basivalvular sclerites of ovipositor without any well defined spines on its lower inner margin ..... ***O. velox*** Fabricius, 1787
2. Ventral surface of subgenital plate with a broad median longitudinal groove running from posterior margin at least two middle of plate, with or without longitudinal ridge on each side 3
--- Ventral surface of subgenital plate convex, flat or, at most, with a weak apical concavity..... 4
3. Ovipositor valves with long hook like dents, posterior ventral basivalvular sclerites with very small spinelets on its inner ventral margin. Male cercus with subacute or truncate apex ..... ***O. hyla*** Serville, 1831

--- Ovipositor valves with short dents, posterior ventral basivalvular sclerites with a large spine on its inner ventral margin. Male cercus with bifid apex..... ..... ***O. japonica*** Blanchard, 1853

4. Posterior margin of female subgenital plate with one or two spines medially. Male supra anal plate without lateral tubercles, cercus never much compressed, narrowing apically 5

--- Posterior margin of female subgenital plate almost straight and smooth. Male supra anal plate with a tubercles on each side of median apical process, cercus laterally much compressed and of uniform width ..... ***O. fuscovittata*** Marschall, 1836

5. Posterior margin of female subgenital plate with a single spine medially. Male supra anal plate usually with well developed basilateral folds..... 6

--- Posterior margin of female subgenital plate with a pair of spines medially. Male supra anal plate relatively flat, without basilateral folds .... ***O. chinensis*** Thunberg, 1815

Oxya fuscovittata (Marschall, 1836)

(Plate 31; Fig. 29)

Gryllus fuscovittatus Marschall, 1836. *Ann. Naturhist. Mus. Wien* **1**(2): 211.

Oxya turanica Uvarov, 1912. *Trudy Russk. Entomol. Obshch.* **40**(3): 28.

Oxya oryzivora Willemse, C. 1925. *Tijdschr. v. Entomologie* **68**: 25. Syn. by Hollis. 1971. *Bull. Br. Mus. (Nat. Hist.) Ent.* **26**(7): 289.

Oxya uvarovi Willemse, C. 1925. *Tijdschr. v. Entomologie* **68**:11, 22. Syn. by Hollis. 1971. *Bull. Br. Mus. (Nat. Hist.) Ent.* **26**(7): 289.

Oxya fuscovittata (Marschall); Mishchenko, 1965. *Fauna of Russia Orthopt*: 148[125].

Male genitalia: Supra-anal plate triangular, trapezoid, lateral tubercles prominent, posterior lobe slightly less developed, cercus broad, strongly compressed, apex bifid. Sub genital plate broad, lateral margin straight, narrowing apically, apex rounded, setose confined to apical margin (centrally). Epiphallus with narrow bridge, without an

ancorae and with tooth like lophi; valvular plate of cingulum with shallow structure; apical valve of aedeagus is thickened.

Female genitalia: Supra-anal plate short, broad, wider than long, lateral margins converging invert, apical margins narrowing and making apex rounded, cercus wide uniformly broad, one and half times as long as wide, apex truncated. Sub genital plate with very broadly flattened ventral surface. Posterior margin emerginates medially straight or with two very small medial spines. Spermatheca short apical diverticulum short and pre-apical diverticulum is double the size of apical diverticulum and forms an inverted 'L' shaped loop. Valve of ovipositor with tooth like marginal spines,

Material Examined: Meghalaya, Nongstoin, 15-I-2011, on grasses, 3♀♀. Shillong, Ladmawphlong, 23-X-2008, on grasses, 2♀♀. Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 1♀. Mizoram, Aizwal, Selesih, 11-II-2009, on grasses, 5♀♀, 2♂♂. Manipur, West Imphal, 15-X-2009, on grasses, 2♀♀. Nagaland, Dimapur, 19-X-2009, on grasses, 7♀♀, 3♂♂.

Morphometry: (length in mm)

Male: Body length 20.15, Tegmina 16.43, Pronotum 1.61, Hind femur 12.92

Female: Body length 25.0, Tegmina 20.05, Pronotum 1.75, Hind femur 15.84

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chattisgarh, Delhi, Goa, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Uttar Pradesh and West Bengal.

Elsewhere: Afghanistan, Bangladesh, Nepal, Pakistan and USSR (Southwest).

Oxya japonica vitticolis (Blanchard, 1853)

(Plate 32; Fig. 27)

Acridium vitticole Blanchard, 1853. *In Hombron & Jacquinot [Ed.]. Voyage au Pole Sud et dans l' Océanie sur les Corvettes l' Astrolabe et la Zélée exècuté par ordre du roi pendant les années* 1837-1838-1839-1840 371, 373.

Heteracris gavisa Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 669. Syn. by Key. 1986. CSIRO *Entomol. Tech. Paper* **24**:10.

Oxya japonica vitticolis (Blanchard); Hollis, 1971. *Bull. Br. Mus. (Nat. Hist.) Ent.* **26**(7): 307.

Female genitalia: Supra-anal plate longer than wide, lateral margins highly diverging posteriorly, apex broadly rounded. Cercus broad basally and narrowing apically, two times as long as wide, apex conical. Sub genital plate lateral margin straight, posterior margin concave with two notches medially, jannone's organ present, two in number. Egg-guide broad basally, gradually narrowing apically, apex pointed, three times as long as wide. Spermatheca apical diverticulum slender, moderately broad, much longer than pre-apical diverticulum, pre-apical diverticulum elongate narrow. Ovipositor valves long and slender, slightly less than two times as long as wide, dorsal valve with edges serrated, apex obtusely rounded, ventral valve with edges denticulate, apex conical, lateral apodeme short and narrow.

Material Examined: Meghalaya, East Khasi Hills, CPRS, 14- X-2009, on grasses, 5♀♀.

Morphometry: (length in mm)

Female: Body length 21.0, Tegmina 15.5, Pronotum 4.3, Hind femur 12.1

Distribution: India: Meghalaya.

Oxya velox (Fabricius, 1787)

(Plate 33; Fig. 30)

Gryllus velox Fabricius, 1787. *Mantissa insectorum exhibens species nuper in Etruria collectas a Ptro Rossio* 1: 239.

Heteracris apta Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* 4: 666. Syn. by Hollis. 1971. *Bull. Br. Mus. (Nat. Hist.) Ent.* **26**(7): 297.

Oxya velox (Fabricius); Kirby, 1910. *A Synonymic Catalogue of Orthoptera,* London: 393.

Oxya velox (Fabricius); Hollis, 1971. *Bull. Br. Mus. Nat. Hist. (Ent.),*: 297.

Male genitalia: Supra-anal plate rounded, triangular posterior portion, cercus conical with subacute apex. Sub genital plate wide basally, narrowing apically, apex truncated setae, confined to apically. Epiphallus with narrow bridge, without ancorae, vulvular plate of cingulum large, upcurved, apex enlarged, apodeme is long, flat, curved at the anterior end, vulvular plate of cingulum more or less bean shaped. Aedeagus apical valve much narrow, elongate, apex blunt, basal valve narrowing apically and broad at base almost as long as apical valve.

Female genitalia: Supra-anal plate short, broad, wider than long, lateral margins converging invert, apical margins narrowing and making apex rounded, cercus elongate narrow, narrowing apically, two and half times as long as wide, apex bluntly rounded. Ventral surface of sub genital plate in posterior half with median longitudinal concavity bordered on each side by lateral longitudinal ridge. Median pair is spiny on posterior margin, widely spread. Spermatheca medium size, apical diverticulum bent downwards and pre-apical diverticulum narrow, more or less straight and coiled at the anterior end, pre-apical diverticulum broadly tubular and curved, as long as apical diverticulum. Ovipositor, dorsal valve slightly less than twice the length of lateral

apodeme, dorsal margin with small and uniform blunt dents, ventral valve with small uneven blunt dents. Valve of ovipositor with tooth-like spiny structures.

Material Examined: Tripura, Agartala, Mohanpur, 15-II-2009, on grasses, 5♀♀, 7♂♂. Manipur, West Imphal, 15-X-2009, on grasses 8♀♀, 3♂♂. Nagaland, Kohima, 21-X-2009, on grasses, 9♀♀, 3♂♂.

Morphometry: (length in mm)

Male: Body 22.4, Pronotum 6.1, Tegmina 19.4, Hind femur 14.4

Female: Body 26.6, Pronotum 6.4, Tegmina 23.0, Hind femur 17.6.

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Bihar, Assam, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Orissa, Rajsthan, Sikkim, Tamil Nadu, Tripura, Uttrakhand, Uttar Pradesh and West Bengal. ,

Oxya chinensis (Thunberg, 1815)

(Plate 34; Fig. 31)

Gryllus chinensis Thunberg, 1815. *Mem. Acad. Imp. Sci. St. Peterburg* **5**: 253, 254.

Oxya vicina Brunner, 1893. *Ann. Mus. Civ. Stor. Nat. Genova* **213**(33): 152.

Oxya adentata Willemse, C. 1925. *Tijdschr. v. Entomologie* **68**: 26.

Oxya shanghaiensis Willemse, C. 1925. *Tijdschr. v. Entomologie* **68**: 54.

Oxya chinensis (Thunberg); Uvarov, 1926. *Bull. Ent. Res.* **17:** 48.

Oxya manzhurica Bei-Bienko, 1929. *Konowia* **8**: 105.

Oxya rammei Tsai, P. 1931. *Mitt. Zool. Mus. Berlin* **17**: 439. Syn. by Hollis. 1971. *Bull. Br. Mus. (Nat. Hist.) Ent.* **26**(7): 322.

Oxya manzhurica nakii Furukawa. 1939. *Rep. First scient. Exped. Manchoukuo Sect. V, Div.* **15**(16): 84, 164.

Oxya sinuosa Mishchenko, 1951. In Bei-Bienko & Mishchenko. *Keys to the Fauna of the U.S.S.R.* [1963 English translation no. 38]. *Locusts and Grasshoppers of the U.S.S.R. and Adjacent Countries* **1**: 167[177].

Oxya sianensis Zheng, Z. 1964. *Acta Entomol. Sin.* **13**(6): 885.

Male genitalia: Supra-anal plate broad, wider than long, lateral margins diverging apically, apex rounded. Cercus long and slender, slightly narrowing apically, almost three times as long as wide, apex rounded. Sub genital plate triangular, lateral margin forming blunt apex. Epiphallus with bridge divided medially, lophi well developed. Aedeagus apical valve long, narrow, much longer than basal valve broad. Apical valve strongly curved downward.

Female genitalia: Supra-anal plate broad basally, lateral plates diverging apically, longer than wide, apex bluntly rounded. Cercus broad basally, narrowing basally incurved, apex blunt. Sub genital plate lateral margin straight, posterior margin wavy, concave medially, jannone's organ present with two small patches. Egg-guide elongate narrow, more than three times as long as wide, apex pointed. Spermatheca apical diverticulum, basal half broad with protuberance, apical half long, elongate narrow. Pre-apical diverticulum long and narrow. Ovipositor dorsal valve broad, robust, slightly shorter than lateral apodeme, dorsal edge dentate, apex pointed, ventral valve long and slender, edge dentate, apex acutely rounded.

Material Examined: Assam, Diphu, Karbi Anglong, 13-II-2011, on grasses, 15♀♀, 17♂♂. Assam, Morigaon, Moirabari, 13-IV-2010, on grasses, 13♀♀, 7♂♂.

Morphometry: (length in mm)
Male: Body 20.4, Pronotum 3.4, Tegmina 15.9, Hind femur 13.5

Female: Body 20.75, Pronotum 5.4, Tegmina 21.4, Hind femur 13.3

Distribution: India: Kerala and Meghalaya.

Elsewhere: China, Japan, Korea, Taiwan,Vietnam and USSR.

Oxya hyla hyla Serville, 1831

(Plate 35; Fig. 32)

Oxya hyla Serville, 1831. *Ann. Sci. nat.* **22**(86): 28-65, 134-167, 262-292.

Heteracris viridivitta Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 605-801. Syn. by Johnston, Henry Bennett. 1956. *Annotated catalogue of African grasshoppers* 251.

Oxya serrulata Krauss, 1890. *Zoologische Jahrbücher. Abt. Syst. Geogr. und Biol. der Tiere* **5**(4): 662.

Oxya serrulata minor Sjöstedt. 1910. In Sjöstedt [Ed.]. Abteilung 15-22. Wissenschaftliche Ergebnisse der schwedischen zoologischen Expedition nach dem Kilimandjaro, dem Meru und den umgebenden Massaisteppen Deutsch-Ostafrikas, 1905-1906 unter Leitung von Prof. Dr. Yngve Sjöstedt **3**: 185, 196.

Oxya acuminate Willemse, C. 1925. *Tijdschr. v. Entomologie* **68**: 44.

Female genitalia: Supra-anal plate broadly angular, wider than long, apex broadly rounded; apex elongate, incurved, twice as long as wide, apex rounded. Sub genital plate with posterior margin truncated in middle; posterior marginal setae absent; jannone's organs present; egg-guide broad at base, long and narrow apically. Spermatheca with apical diverticulum long, bearing a small protuberance as its apical one-fifth; pre-apical diverticulum broad and curved, thrice the width of apical diverticulum. Ovipositor with dorsal valve long and narrow, five and a half times as long as wide, longer than lateral apodeme, dorsal edge with acute spines, basal sclerite narrow and serrated.

Material Examined: Tripura, South Tripura, Udaipur, 16-II-2009, on grasses, 15♀♀. Manipur, East Imphal, 16-X-2009, on grasses, 5♀♀. Nagaland, Dimapur, 20-X-2009, on grasses, 8♀♀.

Morphometry: (length in mm)

Female: Body 26.5, Tegmina 23.0, Pronotum 6.4, Hind femur 17.6

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Bihar, Assam, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Orissa, Rajsthan, Sikkim, Tamil Nadu, Tripura, Uttrakhand, Goa, Delhi, Chattisgarh, Kerala, Gujrat, Uttar Pradesh and West Bengal.

Elsewhere: Afghanistan, Africa, Angola, Bangladesh, Benin, Cameroun, Chad, Iran, Gambia, Ghana, Giunea, Kenya, Liberia, Madagaskar, Maldieve Island, Mali, Malawi, Nepal, Niger, Nigeria, Pakistan, Senegal, Sudan, Sri Lanka, Tanzania, Uganda, Zaire and Zambia.

Genus *Caryanda* Stal, 1878

Caryanda Stal, 1878. *Bihang Kungl. Svenska Vet. Akad. Handl.* **5**(4): 47.

Type-species: *Acridium (Oxya) spuriun* Stal, 1860.

Dibastica Giglio-Tos, 1907: 9 (Hollis, 1975. *Bull. Br. Mus. Nat. Hist.* (*Ent.*): 217).

Type-species: *Dibastica modesta,* Giglio-Tos, 1907.

Austenia Ramme, 1929: 331. (Preoccupied by *Austenia* Nevill, 1878: 16). (Hollis 1975. *Bull. Br. Mus. Nat. Hist.* (*Ent.*): 217).

Type-species: *Austenia Cylindrica* Ramme, 1929.

Austeniella Ramme, 1931: 934. (Replacement name for *Austenia* Ramme, 1929). (Hollis, 1975. *Bull. Br. Mus. Nat. Hist.* (*Ent.*): 217).

Diagnosis: Head conical; fastigium of vertex, from above, pentagonal, wider than long, without median longitudinal carinula; frontal ridge sulcate. Eyes normal. Antenna as long as combined lengths of head and pronotum. Prosternal process conical with subacute apex. Dorsum of pronotum weakly flattened, median carina weak, lateral carinae absent, weakly crossed by three transverse sulci; mesosternal interspace slightly

longer than wide. Tegmina and hind wings normally reduced to micropterous condition, some species brachypterous and one species is rarely macropterous. Lower genicular lobe of hind femur spined; hind tibia hardly expanded apically, upper margins acute, external apical spine present. In male 10^{th} abdominal tergite with or rarely without furcula on hind margin; epiphallus with divided bridge and clearly developed ancorae. Female ovipositor valves long, slender, evenly toothed.

The genus is represented by a single species from this region.

***Caryanda paravicina* (Willemse, 1925)**

(Plate 36; Fig. 33)

Oxya paravicina Willemse, 1925. *Tidjschr. Ent.*, **68**: 55.

Caryanda paravicina (Willemse); Hollis, 1975. *Bull. Br. Mus. Nat. Hist.* (*Ent.*) **31**: 218.

Female genitalia: Supra-anal plate triangular, apex pointed, much longer than wide. Cercus broad basally, narrowing apically, two times as long as wide, apex bluntly rounded. Sub genital plate, lateral margins convex medially and concave posteriorly with straight in the middle. Egg-guide narrowing apically, three times as long as wide, apex pointed. Spermatheca pre-apical diverticulum long and slender, curved medially. Pre-apical diverticulum long and narrow. Ovipositor dorsal valve moderately broad, slightly shorter than lateral apodeme, dorsal edge smooth, apex bluntly rounded, ventral valve curved medially, dorsal edge with tooth, apex pointed, dorsal valve slightly shorter than lateral apodeme.

Materaial Examined: Meghalaya, Jowai, Ummolong, 22-X-2008, on grasses, 17♀♀. Manipur, Thoubal, 17-X-2009, on grasses, 7♀♀. Nagaland, Kohima, 21-X-2009, on grasses, 5♀♀.

Morphometry: (length in mm)

Female: Body 13.0, Tegmina 3.6, Pronotum 5.8, Hind femur 12.8

Distribution: India: Meghalaya.

Genus Cercina Stal, 1878

Cercina Stal, 1878. *Bihang Kungl. Svenska Vet. Akad. Handl.* **5**(4): 97.

Type-Species: *Cercina obtusa* Stal, 1878.

Diagnosis: Head conical; fastigium from above, short, triangular or pentagonal, wider than long, median longitudinal carina absent; frontal ridge widely sulcate and not quite extending to clypeus; eyes normal; antennae shorter than head and pronotum together; prosternal process subconical, antero-posteriorly flattened with subacute apex; dorsum of pronotum flattened, shallowly crossed by two or three transverse sulci, median carina very weak, lateral carinae absent; mesosternal interspace longer than wide; tegmina and hind wings reduced, scale-like, former not extending beyond 3rd abdominal tergite; lower genicular lobe of hind femur pointed or spined; hind tibia moderately expanded in apical half, with acute upper margins, external apical spine of hind tibia present; 10th abdominal tergite without furcula in male; female ovipositor valves long, slender, even toothed.

The genus is represented by a single species from this region.

Cercina mussoriensis Prasad & Sinha, 1956

(Plate 37; Fig. 34)

Cercina mussoriensis Prasad & Sinha. 1956. *Proc. nation. Acad. Sci. India B* **26**(1): 30.

Female genitalia: Supra-anal plate elongate, angular; slightly less than one and half times longer than wide, apex rounded, cerci broad basally, narrowing apically; almost

two times as long as wide, apex bluntly rounded. Sub genital plate wide, apical margin semicircular without setae, egg-guide short, narrow; apex pointed. Ovipositor valves elongate, narrow; dorsal edge of dorsal valve smooth, apical tip bluntly rounded, dorsal valve shorter than lateral apodeme; ventral valve uniformly broad, apical condyle not prominent, apical tip blunt.

Material Examined: Assam, Guwahati, Patorkuchi, 30-X-2008, on grasses, 2♂♂.

Morphometry: (length in mm)

Female: Body length: 16.75, Tegmina: Brachypterous, Pronotum: 1.47, Hind femur: 11.3

Distribution: India : Uttarakhand, Assam.

Genus *Lemba* Huang, 1983

Lemba Huang, C. 1983. *Zool. Res.* 4(2): 149.

Type-Species: *Lemba daguanensis* Chunmei, 1983.

Diagnosis: Body of medium size; Head conical; fastigium of vertex short, rounded, separated from vertex by a shallow depression; frontal ridge distinct but subobsolete at clypeo-frontal suture; interocular distance longer than subocular furrow; pronotum rugose, disc with lateral angles rounded into lateral lobes, posterior margin obtusely angularly excised; prosternal process slightly compressed, conical, apex acute; mesosternal lobes longer than wide, metasternal lobes contiguous (male) or very narrowly separated (female); tegmina covering tympana; hind femur moderately slender, dorsal carina smooth and terminating in a small ventral genicular lobes terminating in a spine; hind tibia with dorsal margin angularly rounded, with 8 external and 20 internal spines at dorsal margins; apical spine present at both sides.

The genus is represented by two species from this region. A key for their separation is given below:

Key to the species of the genus *Lemba* Huang, 1983

1. Lateral margins of Supra-anal plate almost parallel and apex of cercus conical, lateral margins of sub genital plate parallel in basal half diverging apically with apex long and bifurcate, lophi broad with apex pointed ancorae short and broad with apex blunt, aedeagus with apical valve very long, apex blunt, much longer than basal valve, basal valve very long and broad .... ***Lemba motinagar*** Ingrisch *et al.*, 2004

--- Lateral margins are diverging in the middle and apex of cercus acutely rounded, sub genital plate triangular with notch apically, Lophi broad with apex bluntly rounded, ancorae short, apex pointed, aedeagus with apical valve long with apex pointed, longer than basal valve, basal valve moderately broad..... ..... ***Lemba elongata*** sp.n.

***Lemba elongata* sp.n.**

(Plate 38; Fig. 36)

Male genitalia: Supra-anal plate broad, slightly longer than wide, lateral margins diverging apically, apex bluntly rounded. Cercus broad and slightly narrowing apically, twice ae long as wide, slightly excurved, apex acutely rounded. Sub genital plate triangular with a notch medially. Epiphallus bridge divided, ancorae short, apex pointed. Aedeagus apical valve long and narrow, longer than basal valve, apex pointed, basal valve moderately broad.

Remarks: The new species differs from *Lemba motinagar* in key characters.

Type **Material :** Holotype ♂, Meghalaya, Shillong, Tyrsad, 24-X-2009, on grasses, 11 paratypes ♂♂.

Morphometry: (length in mm)

Male: Body 15.32, Pronotum 1.34, Hind femur 9.76

Distribution: India: Meghalaya.

Etymology: Descriptive name is given because the subgenital plate is elongated.

Lemba motinagar Ingrisch *et al.*, 2004

(Plate 39; Fig. 35)

Lemba motinagar Ingrisch *et al.*, 2004. *Tijdschr. Voor Entomol.*, **147**: 290.

Male genitalia: Supra-anal plate broad, as long as wide, lateral margins slightly diverging apically, apex rounded. Cercus broad basally and gradually narrowing apically, twice as long as wide, apex conical. Sub genital plate with lateral margin straight, strongly diverging posteriorly, posterior margin extended with a notch medially. Epiphallus bridge divided, ancorae short and broad, apex blunt, lophi well developed. Aedeagus with apical valve very long and narrow, downcurved, basal valve long and broad, much longer than basal valve, apex blunt.

Female genitalia: Supra-anal plate lateral margins forming rounded apex, slightly longer than wide. Cercus short and broad, narrowing apically, less than twice as long as wide, apex bluntly rounded. Sub genital plate lateral margins straight, posterior margin slightly curved, serrated medially forming dents on either side of egg-guide. Apical half of egg-guide broad, abruptly narrowing apically, apex pointed. Spermatheca long and slender with protuberance. Ovipositor dorsal valve robust, dorsal edge strongly serrated, apex bluntly rounded, slightly shorter than apodeme, ventral valve elongate narrow, edge curved and serrated, apex or tip bluntly rounded.

Material Examined: Meghalaya, East Khasi Hills, CPRS, 10-X-2009, on grasses, 15♂♂, 20♀♀; Kyrdemkhla, 10-X-2009, on grasses, 10♂♂, 15♀♀.

Morphometry: (length in mm)

Male: Body length 12.0, Pronotum 4.4, Hind femur 8.5

Female: Body length 18.2, pronotum 5.5, Hind femur 13.5

Distribution: India: Meghalaya and Tripura.

Genus *Pseudoxya* Yin & Liu, 1987

Pseudoxya, Yin, X.-C. & Z.-W. Liu, 1987. *Acta Zootaxonomica Sin.* **12**(1): 66 [71] Mishchenko & Storozhenko. 1990. *In Gorochov [Ed.]. News of 121etazoan121c and faunistics of Vietnam insects part 1. Trudy Zool. Inst., Akad. Nauk SSSR, Leningrad* **209**: 32.

Type-Species: *Oxya diminuta* Walker, 1871.

Diagnosis: Body moderately sized. Head shorter than pronotum. Antennae filiform. Face, in profile, oblique. Vertex convex from above, fastigium rounded. Lateral foveolae absent. Frontal ridge sulcate, with lateral carinae nearly parallel. Eyes oval. Pronotum cylindrical, slightly flattened in the back, posterior margin convex; median carina present, lateral carinae absent. Prosternal process conical with rounded apex. Mesosternal lateral lobes somewhat wider than long. Metasternal lateral lobes meeting in hind part. Elytra and wings developed, extending beyond the middle of hind femur, touching in mid dorsal line when folded and elytra with stridulatory pegs in frontal areas. Upper carina of hind femur smooth, keenly spined in apex; lower genicular lobe spined. Hind tibia expanded in apical half and with external apical spine. Tympanum developed. In male, 10^{th} abdominal tergite with furcula. Epiproct triangular, rounded in apex. Cerci conical. Epipallus with devided bridge, ancorae and one pair of thin lophi. In female, ovipositor valves long, slender and with tooth.

The genus is represented by a single species from this region.

Pseudoxya diminuta (Walker, 1871)

(Plate 40; Fig. 37)

Oxya diminuta Walker, 1871. *Cat. Derm. Salt. Brit. Mus.*, **5**: 64.

Oxya rufipes Brunner, 1893. *Ann. Mus. Civ. Star. Nat. Genova Ser.* **2**, 13:153. Syn. by Willemse, Cornelis Jozef Maria. 1955[1956]. *Publ. Natuurhist. Genootsch. Limburg* **8**:146.

Pseudoxya diminuta (Walker); Hollis, 1975. *Bull. Br. Mus. Nat. Hist. (Ent.),* **31**: 217.

Male genitalia: Supra-anal plate broad, slightly broader than long, lateral margins strongly diverging apically, apex rounded. Cercus elongate, narrowing apically, three times as long as wide, apex acutely rounded. Sub genital plate lateral margin straight, gradually diverging apically, apex rounded. Epihallus bridge divided medially, lophi developed. Aedeagus apical valve long and narrow, incurved.

Material Examined: Meghalaya, East Khasi Hills, CPRS, 12-X-2009, on grasses, 20♂♂.

Morphometry: (length in mm)

Male: Body length 12.0, Tegmina 11.9, Pronotum 4.4, Hind femur 8.5

Distribution: India: Andman and Nicobar Islands, Assam and Nagaland.

Elsewhere: Bhutan, Combodia, China, Laos, Myanmar, Singapore, Sumatra, Thailand, Vietnam and West Malaysia.

SUBFAMILY SPATHOSTERNINAE REHN, 1957

Spathosterninae, Rehn, 1957. *Grasshoppers and Locusts (Acridoidea) of Australia*, **3**: 93.

Diagnosis: Body of variable shape; head prognathus, hypognathus or opisthognathus, without fastigial furrow; tegmina with a series of regular, parallel, thickened, transverse stridulatory veinlets between the radial and medial veins (radial area); prosternal tubercle present; mesosternal space open or closed; tympanum present, in apterous

forms absent; lower basal lobe of hind femur shorter than upper one; external apical spine of hind tibia present or absent; epiphallus bridge-shaped, without dorso-lateral appendages, ancorae and lophi present; basal and apical valves of penis divided, but sometimes there is a tendency to form flexure.

The subfamily is represented by a single genus from this region.

Genus *Spathosternum* Krauss, 1877

Spathosternum Krauss, 1877, *Sitz. Akad. Wiss. Wien, Math.- nat. Cl.lxxvi* (1), 44.
Type-Species: *Tristria nigro-taeniata* Stal, 1876.

Diagnosis: Body of small size; antennae filiform, shorter than head and pronotum together; fastigium of vertex parabolic; frons strongly oblique; frontal ridge sulcate; dorsum of pronotum flattened, crossed by three transverse sulci, median carina linear, crossed by posterior sulcus only, lateral carinae present; 123etazoan as long as prozona, posterior margin rounded; prosternal process antero-posteriorly compressed, inclined backwards; mesosternal interspace strongly constricted; tegmina and wings fully developed; radial area of tegmen with series of regular transverse stridulatory veinlets; hind femur slender, external apical spine of hind tibia present; arolium moderately large. Male: supra anal plate triangular, 123etazo simple, conical; subgenital plate short, subconical with obtuse apex; epiphallus, bridge undivided, ancorae small, lophi lobiform; aedaegus, apical valve as long as basal valve. Female genitalia: subgenital plate, posterior margin setose, with a conical projection medially; ovipositor, dorsal valve about as long as lateral apodeme; spermatheca, pre-apical diverticulum uniformaly broad and recurved apically, longer than apical diverticulum.

The genus is represented by a single species from this region.

***Spathosternum prasiniferum prasiniferum* (Walker, 1871)**

(Plate 41; Fig. 38)

Heteracris prasinifera Walker, 1871. *Cat. Derm. Salt. Br. Mus.* London, 65.

Caloptenus caliginosus Walker, 1871. *Cat. Derm. Salt. Br. Mus.* London, 69.

Stenobothrus strigulatus Walker, 1871.*Cat. Derm. Salt. Br. Mus.* London, 82.

Stenobothrus simplex Walker, 1871. *Cat. Derm. Salt. Br. Mus.* London, 82. Syn. by Otte, Daniel. 1995. *Orthoptera Species File* **4**: 98.

Stenobothrus rectus Walker, 1871. *Cat. Derm. Salt. Br. Mus.* London, 83.

Spathosternum venulosum Stal, 1878. *Bihang Kungl. Svensk. Vet. Akad. Handl.*, Stockholm, **5**(4): 97. Syn. by Otte, Daniel. 1995. *Orthoptera Species File* **4**:98.

Spathosternum prasiniferum (Walker); Kirby, 1914. *Faun. Brit. India. Acrididae,* 208.

Male genitalia: Supra-anal plate broadly triangular, wide than long, apex obtusely conical; 124etazo moderately broad, two and a half times as long as wide, apex narrowing apically. Sub genital plate wide, slightly longer than wide, broad basally, narrowing at apex, apex obtusely conical. Epiphallus with wide bridge, ancorae small with bluntly rounded apices and lophi small, rounded. Aedeagus 124etazoa, apical valve narrow, slightly curved, narrower and shorter than basal valve, connected with basal valve with flexure, apex rounded; basal valve moderately broad, of uniform width.

Female genitalia: Supra-anal plate elongate, uniformly broad, narrowing at apex, apex obtusely rounded; 124etazo slender, uniformly broad, slightly more than twice as long as wide, apex rounded. Sub genital plate with posterior margin having a conical projection in middle; posterior marginal setae and jannone's organs present; egg-guide broad, less than twice as long as wide. Spermatheca with apical diverticulum with basal half broader, shorter than the pre-apical diverticulum. Pre-apical diverticulum

uniformly broad and curved. Ovipositor with dorsal valve moderately broad, slightly more than three times as long as wide, as long as lateral apodeme, dorsal condyle much prominent; ventral valve with slope deeply concave, lateral tooth absent, lateral and basal sclerites smooth.

Material Examined: Sikkim, Gezing, West Ditrict, 15-X-2008, on grasses, 6♀♀, 2♂♂. Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 4♀♀; Shillong, Cherrapunji, 23-X-2008, on grasses, 5♀♀, 1♂. Assam, Dibrugarh, 10-II-2011, on grasses, 2♂♂. Arunachal Pradesh, Bomdila, West Kameng, 7-II-2009, on grasses, 9♀♀, 4♂♂. Manipur, Ukhrul, 14-X-2009, on grasses 4♀♀, 3♂♂. Nagaland, Dimapur, 19-X-2009, on grasses, 7♀♀, 4♂♂.

Morphometry: (length in mm)

Male: Body length 14.77, Tegmina 13.15, Pronotum 0.89, Hind femur 9.39

Female: Body length 21.5, Tegmina 15.2, Pronotum 1.45, Hind femur 11.98

Distribution: India : West Bengal, Andhra Pradesh, Arunachal Pradesh, Bihar, Goa, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajsthan, Tamil Nadu and Uttar Pradesh.

SUBFAMILY TROPIDOPOLINAE JACOBSON, 1905

Tropidopolinae, Jacobson. 1905 In Jacobson & V.L. Bianchi. *Orthopteroid and Pseudoneuropteroid Insects of Russian Empire and adjacent countries* 73, 306.

Diagnosis: Body strongly elongate, narrow; head cylindrical in profile; dorsum of pronotum of variable shape, median and lateral carinae present or absent; prosternal process present; mesosternal interspace closed; tegmina or wings fully developed or shortened; tympanum present; hind femur never robust, lower basal lobe shorter than upper one; external apical spine of hind tibia present; arolium small.

Male 126etazo short, widened apically; Epiphallus, bridge undivided, ancorae and lophi present; aedeagus, basal and apical valves connected by flexure; spermatheca with apical diverticulum long and narrow, pre-apical diverticulum long, curved, narrow basally and broad apically.

The subfamily is represented by three genera from this region. A key for their separation is given below:

Key to the genera of the subfamily Tropidopolinae Jacobson, 1905

1. Prosternal process long, nearly or strongly reaching anterior margin of mesosternum; hind femur with knee lobe short or long 2
--- Prosternal process short not reaching anterior margin of mesosternum; hind femur with knee lobe short and blunt ..... ***Neoxyrrhepes*** gen. n.
2. Prosternal process compressed antero-posteriorly, apex rectangular, strongly reaching anterior margin of mesosternum; hind femur with knee lobe short and rounded .....***Tristria*** Stal, 1873
--- Prosternal process compressed laterally, apex conical, nearly reaching anterior margin of mesosternum; hind femur with knee lobe long and acute .... ***Oxyrrhepes*** Stal, 1873

Genus ***Neooxyrrhepes*** **gen. n.**

Type Species: Neooxyrrhepes meghalayensis sp. n.

Diagnosis: Body smaller in size, elongate. Integument nearly smooth, not shiny. Antennae much longer than head and pronotum together, strongly compressed in basal half while uncompressed filiform in apical half with elongated segments. Head elongate, longer than pronotum, frons strongly oblique. Frontal ridge narrow, deeply sulcate with lateral carinulae acute, merging anteriorly, slightly constricted below median ocellus, gradually diverging posteriorly. Fastigium of vertex elongate, twice as long as wide, fairly concave with sharp carinulae, fastigial furrow prominent,

interocular distance constricted as compared to fastigium width, much narrower than with of frontal ridge and about slightly less than one-third of maximum diameter of eye. Eyes elongate oval with fair convexity. Pronotum of uniform width, 127etazoan tectiform dorsally while slightly rugose laterally, anterior margin straight, posterior margin angular with obtuse apex, lateral margin angulated rather than round, median and lateral carinae sharp, dorsum crossed by two transverse sulci, posterior transverse sulcus crossing median carina, lateral carinae crossed by two sulci and bordered along by post-ocular bands on lateral sides of pronotum. Prosternal process small, prismatic, apex acute not pointed. Mesosternal interspace much constricted or absent, lobes rounded, square or longer than wide, mesosternal pits closely placed. Tegmina lanceolate, sub-hyaline with sparse veination, wings hyaline, margin markedly wavy, wingspan narrow. Hind femur slender, elongate, upper and lower carina smooth, lower genicular lobe smaller and angular, not pointed. Hind tibia straight with two rows of black tipped spines, inner row with thirteen spines while outer row with fifteen spines, inner pair of spurs slightly longer, hind tarsus elongate, arolium small. Male supra-anal plate short, apex bluntly rounded. Cercus very long, broad. Male sub genital plate rounded, apex broadly rounded. Epiphallus bridge shaped, lophi developed and oval in shape. Aedeagus apical valve elongate narrow, basal valve moderately broad. Female supra-anal with bluntly rounded apex. Cercus uniformly broad, apex rounded. Female sub genital plate with lateral margin straight and diverging basally, apex blunt. Spermatheca, pre-apical diverticulum moderately broad, sac like. Ovipositor valves broad and robust, much shorter than lateral apodeme.

Remarks: The genus is closely related to *Tristria* and *Oxyrrhepes* but differs from former in much elongated antennae, basally ensiform while apical half filiform, elongated and concave fastigium of vertex, acutely sulcate and much narrow frontal

ridge, two transverse sulci crossing dorsum, posterior margin angular, conical prism-shaped prosternal process with acute apex, medially contiguous mesosternal lobes, angulated lower genicular lobe. The genus differs from *Oxyrrhepes* in much elongated antennae, anteriorly produced fastigium, acutely sulcate and narrow frontal ridge, strongly oblique frons, presence of post-ocular bands, two transverse sulci crossing dorsum, medially contiguous mesosternal lobes having straight anterior and posterior margins rather than diagonal, lower genicular lobe acute angular and shorter than upper.

The genus is represented by a single species from this region.

***Neooxyrrhepes meghalayensis* gen. n., sp. n.**

(Plate 42; Fig. 39)

Male genitalia: Supra-anal plate short, uniformly broad, longer than wide, apex bluntly rounded. Cercus very long, broad, three times as long as wide, apex broadly rounded. Sub genital plate rounded, broad basally, narrowing apically, apex broadly rounded. Epiphallus bridge shaped, bridge narrow, uniformly broad, ancorae developed, tip pointed, lophi developed and oval in shape. Aedeagus apical valve elongate narrow, shorter than basal valve, tip pointed, basal valve moderately broad.

Female genitalia: Supra-anal plate longer than wide, apex bluntly rounded. Cercus uniformly broad, two and half time as long as wide, apex rounded. Sub genital plate lateral margin straight and diverging basally, straight in the middle, egg-guide short, broad basally, narrowing apically , almost two times as long as wide, apex blunt. Spermatheca, pre-apical diverticulum moderately broad, sac like. Apical diverticulum long, slender, shorter than pre-apical diverticulum. Ovipositor valves broad and robust, dorsal valve broad uniformly, apical tip blunt and much shorter than lateral apodeme,

ventral valve elongate, narrow, apical tip bluntly pointed, basal sclerite triangular, pointed apically.

Type Material : Holotype ♂; Meghalaya, Jowai, Thaldskin, 22-X-2008, on grasses, 25♀♀, 19♂♂. (Same data as Holotype) Paratypes

Morphometry: (length in mm)

Male: Body 20.1, Tegmina 7.6, Pronotum 4.3, Hind femur 8.5

Female: Body 36.2, Tegmina 20.0, Pronotum 6.3, Hind femur 17.0

Distribution: India: Meghalaya.

Etymology: The new genus *Neooxyrrhepes* is given because it is close to genus *Oxyrrhepes,* it is based on new species. The species name is based on Meghalaya state in India.

Genus *Oxyrrhepes* Stal, 1873

Oxyrrhepes Stal, 1873. *Ofv. K. Vetensk. Akad. Forh.* **30**(4): 53.
Type-species: *Opsomala lineatitarsis* Stal, 1860.

Diagnosis: Body slender, medium to large size; integument finely or more rugosely punctuate; antennae filiform, segments slightly flattened, as long as or longer than head and pronotum together; fastigium of vertex convex, much shorter than longest diameter of eyes, with fine median carinula; foveolae indistinct; frontal ridge never projecting between antennae, with obtuse margins; pronotum somewhat constricted in middle, crossed by three transverse sulci; median carina well developed, lateral carinae nearly parallel; metazona longer than prozona, posterior margin rounded triangular; prosternal process compressed laterally, apex conical, slightly bent backwards, nearly reaching anterior margin of mesosternum; mesosternal interspace contiguous along the median line; tegmina and wings fully developed; hind femur long and slender with knee lobe

long and acute; hind tibia with external apical spine. Female: subgenital plate longer than broad, posterior margin with a triangular projection and lateral incisions.

The genus is represented by a single species from this region.

***Oxyrrhepes obtusa* (Willemse, 1939)**

(Plate 43; Fig. 40)

Oxyrrhepes quadripunctata Willemse, C. 1939. *Natuurh. Maandbl.* **28**: 75.

Oxyrrhepes obtusa var. quadripunctata Willemse, C. 1955. *Publ. natuurhist. Genootsch. Limburg* **8**: 33.

Male genitalia: Supra-anal plate long, triangular, cercus slightly curved, apex acute or dilated. Sub genital plate long, narrow, somewhat compressed, pointed. Epiphallus, bridge undivided, ancorae moderately large, lophi small, finger shaped and incurved. Aedeagus, apical valve of uniform width, as long as basal valve, apex truncate.

Female genitalia: Supra-anal plate elongate, narrowing apically, apex bluntly rounded, cercus elongate, narrow, almost three times as long as wide, apex blunt. Sub genital plate lateral margin straight, central margin diverging and rounded medially. Spermatheca apical diverticulum elongate, curved medially. Pre-apical diverticulum very long, narrow, slender, much longer than apical diverticulum. Ovipositor dorsal valve robust, moderalely broad, apex bluntly rounded, slightly shorter than lateral apodeme, ventral valve elongate, narrow, apex blunt, mesial tooth developed, basal sclerite triangular, apex pointed.

Material Examined: Mizoram, Lunglei, 09-II-2009, on grasses, 4♀♀, 10-II-2009, on grasses, 22♀♀, 12♂♂. Manipur, East Imphal, 16-X-2009, on grasses, 9♀♀, 8♂♂. Nagaland, Phek, 21-X-2009, on grasses, 8♀♀, 7♂♂.

Morphometry: (length in mm)

Male: Body 37.65, Tegmina 34.17, Pronotum 2.5, Hind femur 19.48

Female: Body 48.87, Tegmina 46.68, Pronotum 3.24, Hind femur 27.23

Distribution: India: Arunachal Pradesh, Himachal Pradesh, Karnataka, Kerala, Madhya Prasesh, Manipur, Meghalaya, Nagaland, Orissa, Rajsthan, Sikkim, Tamil Nadu, Uttarakhand and West Bengal.

Elsewhere: China, Indo-China, Indonesia, Java, Lombok, Myanmar and Sri Lanka.

Genus *Tristria* Stal, 1873

Tristria Stal, 1873. *Recencio Orthopterorum. Revue critique des Orthoptères décrits par Linné,* De Geer et Thunberg **1**: 40, 80.

Type-species: *Tristria lacerta* Stal, 1873.

Diagnosis: Body small to medium size; antennae thick, filiform, in basal half compressed shorter than head and pronotum together; fastigium of vertex convex, much shorter than longest diameter of eye with median carinula; frons slightly oblique; frontal ridge flat; dorsum of pronotum flattened, crossed by three trasverse sulci, median and lateral carinae distinct, almost straight; metazoan much shorter than prozona, posterior margin truncate; prosternal process compressed antero- posteriorly, reaching anterior margin of mesosternum, apex rectangular; mesosternal inter-space contiguous for short distance; tegmina and wings fully developed; hind femur slender, knee lobe short and rounded; external apical spine of hind tibia present.

The genus is represented by a single species from this region.

Tristria pulvinata (Uvarov, 1921)

(Plate 44; Fig. 41)

Tapinophyma pulvinata Uvarov, 1921. *Ann. Mag. nat. Hist.* **97**: 497.
Tristria pulvinata (Uvarov); Uvarov, 1929a. *Rev. Suisse Zool.*,: 559.
Tristria pulvinata (Uvarov); Hollis, 1970. *J. nat. Hist*: 465.

Female genitalia: Supra-anal plate narrowing apically, apex blunt, cercus elongate, uniformly broad, three times as long as wide, apex bluntly rounded. Sub genital plate lateral margin diverging basally. Entire margin setose, curved medially, forming a notch in the middle. Spermatheca pre-apical diverticulum elongate, uniformly broad with protuberance. Ovipositor dorsal valve moderately broad, apical tip blunt, dorsal margin slightly serrated, ventral valve elongate narrow, apical tip blunt, basal sclerite elongate narrow, apex blunt.

Material Examined: Tripura, Agartala, Lembuchhera, 13-II-2009, on grasses, 10♀♀.

Morphometry: (length in mm)

Female: Body 33.1, Tegmina 20.7, Pronotum 5.8, Hind femur 18.3

Distribution: India: Andhra Pradesh, Assam, Bihar, Delhi, Haryana, Karnataka, Kerala, Maharashtra, Meghalaya, Orissa, Punjab, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere: Sri Lanka.

SUBFAMILY CYRTACANTHACRIDINAE KIRBY, 1910

Cyrtacanthacridinae, Kirby, W.F. 1910. *A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae)* **3**(2): 358.

Diagnosis: Body of large size; head subglobular; frons vertical; pronotum normally tectiform, median carina distinct, lateral carinae absent; prosternal process present;

mesosternal interspace open, lobes rectangular; tegmina and wings fully developed, rarely reduced; tympanum present; hind femur with lower basal lobe shorter than upper; hind tibia without external apical spine; arolium large. Male cercus long and incurved; Epiphallus, bridge undivided, ancorae small or indistinct, lophi large; aedaegus, basal and apical valves flexure, basal valve with gonopore process; spermatheca, apical diverticulum much longer and slender, pre-apical diverticulum tubular and crescent-shaped.

The subfamily is represented by two genera from this region. A key for their separation is given below:

Key to the genera of family Cyrtacanthacridinae Kirby, 1910

1. Prosternal process strongly bent towards mesosternum, touching or nearly touching it, never laterally compressed ..... ***Chondracris*** Uvarov, 1923

--- Prosternal process vertical or slightly bent towards mesosternum, but not touching it, usually laterally compressed ..... ***Patanga*** Uvarov, 1923

Genus *Chondracris* Uvarov, 1923

Chondracris Uvarov. 1923. *Ann. Mag. nat. Hist.* **911**: 144.

Type-species: *Acrydium roseum* De Geer, 1773.

Diagnosis: Body of large size; integument strongly granulose; antennae filiform, longer than head and pronotum together; fastigium of vertex trapezoidal; frontal ridge slightly narrowed at apex, with depression at and below median ocellus; pronotum tectiform, crossed by three transverse sulci, median carina raised, lateral carinae absent; metazona shorter than prozona, posterior margin angular; prosternal process large, strongly bent towards mesosternum, nearly touching it; mesosternal interspace open, lobes rectangular; tegmina fully developed, apex rounded, veinlets in the apical part more or

less perpendicular to the veins; hind femur with lower basal lobe shorter than upper, external apical spine of hind tibia absent.

The genus is represented by a single species from this region.

***Chondracris rosea* (De Geer, 1773)**

(Plate 45; Fig. 42)

Acrydium roseum De Geer, 1773. *Mémoires pour servir à l' histoire des insectes* **3**: 488.

Cyrtacanthacris lutescens Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **3**: 564, 566.

Gryllus flavicornis Fabricius, 1787. *Mantissa insectorum exhibens species nuper in Etruria collectas a Ptro Rossio* **1**: 237. Syn. by Kirby, William Forsell. 1910. *A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae)* **3**(2): 447.

Chondracris rosea (De Geer); Uvarov, 1923. *Bull. Ent. Res.* **14**: 39.

Chondracris rosea (De Geer); Willemse, C. 1957. *Publ. natuurhist. Genootsch. Limburg* **10**: 248.

Chondracris rosea (De Geer); Mishchenko, 1965. *Fauna of Russia Orthopt*: 498, 499[451, 452].

Female genitalia: Supra-anal plate broad, almost as long as wide, apical margin narrowing, making apex bluntly rounded, cercus short, broad basally, narrowing apically, one and half times as long as wide, apex blunt. Sub genital plate with posterior margin triangular, curved and setose laterally, egg-guide twice as long as wide. Spermatheca with apical diverticulum narrower and much longer than pre-apical diverticulum, pre-apical diverticulum curved and uniformly broad. Ovipositor valves elongate, slender, dorsal valve four times as long as wide, shorter than lateral apodeme, apical tip blunt; ventral valve short, apex pointed, basal sclerite broad and prominent, mesial valve narrow.

Material Examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 5♀♀. Nagaland, Dimapur, 19-X-2009, on grasses, 4♀♀.

Morphometry: (length in mm)

Female: Body length 80.66, Tegmina 73.79, Pronotum 9.2, Hind femur 49.45

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Himachal Pradesh, Kerala, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tamil Nadu, Tripura, Uttrakhand, Uttar Pradesh and West Bengal.

Elsewhere: Bangladesh, Bhutan, China, Hainan, Indonesia, Japan, Java, Korea, Manchuria, Myanmar, Philippines, Taiwan, Thailand and Vietnam.

Genus *Patanga* Uvarov, 1923

Patanga Uvarov, 1923. *Ann. Mag. nat. Hist.* **911**: 143.
Type-species: *Acridium violascens* Walker, 1870.

Diagnosis: Body of large size; integument coarsely punctuate; antennae filiform, slightly longer than head and pronotum together; fastigium of vertex distinctly sloping, feebly impressed; frontal ridge sulcate, more or less parallel-sided, narrower than interocular distance; pronotum distinctly compressed laterally and constricted in prozona, crossed by three shallow transverse sulci, median carina low, lateral carinae absent; metazona about as long as prozona, posterior margin obtusely rounded; prosternal process slightly compressed, inclined towards the mesosternum but not touching it, apex obtusely pointed; mesosternal interspace open, lobes rectangular; tegmina fully developed, apex obliquely rounded, veinlets in the apical part more or less perpendicular to the veins; hind femur with lower basal lobe shorter than upper; external apical spine of hind tibia absent.

The genus is represented by a single species from this region.

***Patanga succinata* (Johansson, 1763)**

(Plate 46; Fig. 43)

Gryllus Locusta succinctus Johannson, 1763. *In Linnaeus. Amoenitates Academicae seu dissertationes variae Physicae, Medicae, Botanicae anthehac seorsim editae, 2nd ed.* **6**: 398.

Acridium assectator Fischer, 1846. Orthoptera Rossica. *Entomographia Imperii Rossici* : 235. Syn. by Uvarov. 1923. *Ann. Mag. nat. Hist.* **912**:365.

Acridium violascens Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **3**: 564, 565, 586, 588.

Cyrtacanthacris fusilinea Walker, 1870a. *Catalogue of the Specimens of Dermaptera Saltatoria* in the Collection of the British Museum, Part III. 564. Syn. by Uvarov. 1923. *Ann. Mag. nat. Hist.* **912**:365.

Cyrtacanthacris inficita Walker, 1870a. *Catalogue of the Specimens of Dermaptera Saltatoria* in the Collection of the British Museum, Part III. : 565. Syn. by Uvarov. 1923. *Ann. Mag. nat. Hist.* **912**:365.

Acridium rubescens Walker, 1870a. *Catalogue of the Specimens of Dermaptera Saltatoria* in the Collection of the British Museum, Part III. : 586. Syn. by Uvarov. 1923. *Ann. Mag. nat. Hist.* **912**:365.

Acridium elongatum Walker, 1870a. *Catalogue of the Specimens of Dermaptera Saltatoria* in the Collection of the British Museum, Part IV: 636. Syn. by Uvarov. 1923. *Ann. Mag. nat. Hist.* **912**:365.

Acridium zehntneri Zehntner,1897. Rechtvleugeligen (Orthoptera). *Moded. Proofstation Oost Java, neuwe serie no.* **37**: 43.

Patanga succinata (Johansson); Uvarov, 1923a. *Ann. Mag. Nat. Hist*: 364, 365.

Patanga succinata (Johansson); Mishchenko, 1952. *Akad. Nauk SSSR, Moscow*: 447.

Patanga succinata (Johansson); Willemse, 1957. *Nat. Hist. Gen. Limburg*: 298.

Female genitalia: Supra-anal plate longer than wide, lateral margin wavy, apex bluntly rounded, cercus wide basally, narrowing apically twice as long as wide, apex rounded. Sub genital plate lateral margin straight, basal margin without setae, surface with

jannone's organ in the form of two small spots. Egg-guide broad basally, narrowing apically, two times as long as wide, apex bluntly rounded. Spermatheca apical diverticulum narrow basally and moderately broad apically. Pre-apical diverticulum long, narrow, slender with additional diverticulum. Ovipositor valves elongate, robust, dorsal valve with apical tip blunt rounded, much longer than lateral apodeme, ventral valve long, narrow, apical tip blunt, mesial tooth present, basal sclerite triangular.

Material Examined: Assam, Silchar, 12-II-2011, on grasses, 5♀♀.

Morphometry: (length in mm)

Female: Body length 60.0, Tegmina 60.2, Pronotum 12.9, Hind femur 34.5

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chattisgarh, Delhi, Goa, Himachal Pradesh, Jammu and Kashmir, Kerala, Lakshadweep Island, Maharashtra, Manipur, Meghalaya, Orissa, Rajsthan, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere: Australia, Borneo, China, Henan Island, Japan, Java, Malaysia, Myanmar, Pakistan, Philippines, South Arabia, Sri Lanka, South East Asia, Somatra and Taiwan.

SUBFAMILY COPTACRIDINAE BRUNNER, 1893

Coptacridinae, Brunner von Wattenwyl. 1893. *Ann. Mus. Civ. Stor. Nat. Genova* **213**(33): 143.

Diagnosis: Body small to medium size; integument rough; head subconical; pronotum cylindrical or tectiform; median carina distinct, lateral carinae absent; prosternal process present; mesosternal interspace open, lobes rounded; tegmina and wings fully developed or reduced; tympanum present; hind femur with lower basal lobe shorter than upper one; hind tibia without external apical spine; arolium small; male cercus laterally compressed, downcurved; male subgenital plate with transverse fold; epiphallus bridge usually divided medially, ancorae large and incurved, lophi large

tooth-shaped or lobiform; aedeagus basal and apical valves connected by flexure, basal valve with gonopore process; ovipositor valves long and without dents; spermatheca apical diverticulum tubular, pre-apical diverticulum tubular, bent in middle, recurved apically.

The subfamily is represented by two genera from this region. A key for their separation is given below:

Key to Indian genera of the subfamily Coptacridinae Brunner, 1893

1. Pronotum with median carina low; crossed by three transverse sulci; aedeagus with apical valves more than half the length of basal valve .... ***Eucoptacra*** Bolivar, I. 1902

--- Pronotum with median carina well raised, crossed by posterior transverse sulcus only, aedeagus with apical valve less than half the length of basal valve ..... ***Epistaurus*** Bolivar, I. 1889

Genus *Eucoptacra* Bolivar, 1902

Eucoptacra Bolivar, 1902. *Ann. Soc. ent. Fr.* **70**: 623, 625.
Type-species: *Acridium (Catantops) praemorsum* Stal, 1860.

Diagnosis: Body small to medium size; integument finely rugose; antennae slightly widened in basal half, as long as or longer than head and pronotum together; fastigium of vertex narrow, concavity in middle, with sharp lateral carinulae; frons almost vertical; frontal ridge between antennae much wider than vertex between eyes; dorsum of pronotum weakly tectiform with median carina low, crossed by three transverse sulci, lateral carinae absent; metazoan as long as or slightly longer than prozona, posterior margin angular; prosternal process cylindrical, apex obtuse; mesosternal interspace open; tegmina or wings fully developed or shortened; hind femur slender; hind tibia nearly straight, not expanded apically. Male: supra anal plate with apex

triangularly rounded, cercus laterally compressed, decurved, apex rounded; subgenital plate short, subconical; epiphallus, bridge divided medially, ancorae tooth-shaped, lophi lobiform; aedeagus, apical valve shorter and much narrower than basal valve. Female: subgenital plate, postero-lateral margin setose; ovipositor, dorsal valve as long as or longer than lateral apodeme, apical tips blunt; spermatheca, apical diverticulum long and uniformly narrow, slightly bent apically, pre-apical diverticulum broadly tubular, bent in middle, recurved towards the blind end, base with a protuberance.

The genus is represented by a single species from this region.

***Eucoptacra praemorsa* (Stal, 1861)**

(Plate 47; Fig. 44)

Acridium (Catantops) praemorsum Stal, 1860. *Kongliga Svenska fregatten Eugenies Resa omkring jorden under befäl af C.A. Virgin åren* 1851-1853 (Zoologi) **2**(1): 330.

Acridium saturatum Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 704. Syn. by Bolívar, Ignacio. 1917[1918]. *Rev. Real Acad. Cienc. Exact., Fisic. Natur.* **16**: 404.

Caloptenus striqifer Walker, F. 1871. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum Supplement*: 66.

Coptacra praemorsa (Stal); Stal, 1873. Recencio Orthopterorum. *Revue critique des Orthoptères décrits par Linné,* De Geer et Thunberg **1**: 58.

Eucoptacra praemorsa (Stal); Bolivar, I. 1902. *Ann. Soc. ent. Fr.* **70**: 623.

Eucoptacra praemorsa (Stal); Willemse, C. 1957. *Publ. natuurhist. Genootsch. Limburg* **10**: 444.

Male genitalia: Supra-anal plate with apex triangularly rounded, cercus laterally compressed, decurved, apex rounded; sub genital plate short, subconical; epiphallus, bridge divided medially, ancorae tooth-shaped, lophi lobiform; aedeagus, apical valve shorter and much narrower than basal valve.

Female genitalia: Supra-anal plate broad basally, narrowing apically, slightly longer than wide, apex rounded, cercus broad basally, narrowing apically, slightly more than twice as long as wide, apex bluntly rounded. Sub genital plate with posterior margin slightly convex in the middle; posterior marginal setae present; Jannone's organs absent; egg-guide less than three times as long as wide. Spermatheca with apical diverticulum uniformly narrow, slightly bent apically; pre-apical diverticulum bent in middle, recurved towards the blind end, base with a protuberance. Ovipositor with dorsal valve more than four times as long as wide, much longer than lateral apodeme, apical tip long and blunt, dorsal edge serrated, dorsal condyle prominent; ventral valve with apical tip long and pointed, slope deeply concave, basal sclerite narrow and with long setae; mesial valve with apical tip recurved.

Material Examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 20♀♀. Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 15♂♂.

Morphometry: (length in mm)

Male: Body 23.16, Tegmina 20.01, Pronotum 1.75, Hind femur 13.77

Female: Body 18.32, Tegmina 19.71, Pronotum 1.35, Hind femur 13.69

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Assam, Chattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtara, Manipur, Meghalaya, Orissa, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Uttarakhand and West Bengal.

Elsewhere: China, Myanmar, Taiwan and Tenasserim.

Genus *Epistaurus* Bolivar, 1889

Epistaurus Bolivar, 1889. J. *Sci. Math. Phys. Nat., Lisboa* (Ser. 2) **1**: 164.
Type-species: *Epistaurus crucigerus* I. Bolivar, 1889.

Diagnosis: Body small to medium size; integument finely rugose; antennae slightly widened apically, as long as or longer than head and pronotum together; fastigium of vertex narrow, concave with sharp lateral carinulae; frons almost vertical; frontal ridge flat, narrowed at the fastigium; dorsum of pronotum strongly tectiform, with well raised median carina, crossed by posterior transverse sulcus only, lateral carinae absent; metazoan about as long as prozona, posterior margin obtusely angular; prosternal process conical; mesosternal interspace open; tegmina and wings fully developed; hind femur slender.

The genus is represented by a single species from this region.

Epistaurus aberrans Brunner, 1893

(Plate 48; Fig. 45)

Epistaurus aberrans Brunner von Wattenwyl, 1893. *Ann. Mus. Civ. Stor. Nat. Genova* **213**(33): 160.

Epistaurus aberrans (Brunner); Willemse, 1957. *Publ. natuurhist. Genootsch. Limburg* **10**: 441.

Male Genitalia: Supra-anal plate elongate, slightly less than two times as long as wide, lateral margin straight apically, diverging apically, forming bluntly rounded apex, cercus elongate, uniformly broad, narrowing apically, apex blunt and excurved, slightly less than three times as long as wide. Sub genital plate elongate, broad basally, narrowing apically, forming a bluntly rounded apex. Epiphallus bridge narrow, flexure, ancorae short, narrow with pointed tip, lophi absent. Aedeagus apical valve short, narrow, shorter than basal valve, apex pointed, basal valve broad basally.

Female Genitalia: Supra-anal plate short, broad, narrowing apically, forming a blunt apex, one and half time as long as wide. Cercus short, broad basally, narrowing apically, slightly more than two times as long as wide, apex blunt. Sub genital lateral margin straight, wavy medially, forming a blunt apex medially. Egg-guide short, narrow, less than two times as long as wide. Spermatheca apical diverticulum uniformly and moderately broad, curved medially. Pre-apical diverticulum very short, reduced to a protuberance. Ovipositor dorsal valve moderately broad, dorsal margin serrate, apical tip pointed, ventral valve narrow, apical tip blunt, basal sclerite narrow triangular with apex pointed, dorsal valve as long as lateral apodeme.

Material Examined: Tripura, Agartala, Lembuchhera, 13-II-2009, on grasses, 15♀♀, 10♂♂.

Morphometry: (length in mm)

Male: Body length: 7.04, Tegmina: 8.45, Pronotum: 4.86, Hind femur: 10.9

Female: Body length: 20.01, Tegmina: 10.1, Pronotum: 5.87, Hind femur: 12.23

Distribution: India: Tamil Nadu and Manipur.

SUBFAMILY EYPREPOCNEMIDINAE BRUNNER, 1893

Eyprepocnemidinae, Brunner. 1893. *Ann. Mus. Civ. Stor. Nat. Genova* **213**(33): 150.

Diagnosis: Body small to large size; head subglobular; dorsum of pronotum flattened or slightly tectiform median and lateral carinae present; prosternal process present; mesosternal interspace open; tegmina and wings fully developed or reduced; tympanum present; hind femur with lower basal lobe shorter than upper one; hind tibia without external apical spine; arolium small or large.

Male cercus laterally compressed, downcurved, extending beyond apex of supra anal plate; epiphallus, bridge usually undivided medially, ancorae and lophi large; aedaegus, basal and apical valves connected by flexure, basal valve with gonopore process; spermateca, apical diverticulum long and tubular, pre-apical diverticulum broadly tubular and curved.

The subfamily Eyprepocnemidinae is represented by a single genera from this region.

Genus *Eyprepocnemis* Fieber, 1853

Eyprepocnemis Fieber, 1853. *Lotos* 3: 98.
Type-species: *Gryllus plorans* Charpentier, 1825.

Diagnosis: Body of medium size; antennae filiform, shorter than head and pronotum together; fastigium of vertex parabolic, slightly concave; frons oblique; frontal ridge flat, sometimes with shallow concavity at ocellus; dorsum of pronotum almost flat, crossed by three transverse sulci, median and lateral carinae distinct; metazona as long as about prozona, posterior margin obtuse angular; prosternal process cylindrical, slightly bent backwards; mesosternal interspace open; tegmina fully developed or shortened; hind femur moderately slender; hind tibia with sparse spines, external apical spine absent. Male: supra anal plate elongate-angular, cercus gradually narrowing apically, incurved and slightly downcurved, apex acute; subgenital plate short, subconical; Epiphallus, bridge undivided, ancorae moderately large, lophi lobiform; aedaegus, apical valve shorter and much narrower than basal valve.

The genus is represented by a single species from this region.

Eyprepocnemis alacris alacris (Serville, 1838)

(Plate 49; Fig. 46)

Acridium alacre Serville. 1838. *Histoire naturelle des insectes. Orthoptères* 682.

Acridium deponens Walker, F. 1859. *Ann. Mag. nat. Hist.* **34**: 222. Syn. by Willemse, Cornelis Jozef Maria. 1957. *Publ. natuurhist. Genootsch. Limburg.* **10**: 241.

Heteracris rudis Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 662, 664. Syn. by Willemse, Cornelis Jozef Maria. 1957. *Publ. natuurhist. Genootsch. Limburg* **10**: 241.

Caloptenus reductus Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 714.

Acridium scitulum Walker, F. 1871. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum Supplement*: 62. Syn. by Willemse, Cornelis Jozef Maria. 1957. *Publ. natuurhist. Genootsch. Limburg* **10**: 241.

Eyprepocnemis alacris (Serville); Willemse, C. 1957. *Publ. natuurhist. Genootsch. Limburg* **10**: 240.

Female genitalia: Supra-anal plate broad, as long as wide, apex bluntly rounded, apex broad basally, narrowing apically, less than twice as long as wide. Sub genital plate with posterior margin having two pairs of acute notches, margins between the outer and median notches serrated and without having setae; Jannone's organ present; egg-guide one and a half times as long as wide. Spermatheca with apical diverticulum long and tubular, truncated at apex; pre-apical diverticulum narrow at basal half and broadened at apical half. Ovipositor with dorsal valve more than three times as long as wide, slightly shorter than lateral apodeme, apical tip long and blunt, dorsal edge serrated; ventral valve with apical tip long and pointed, slope slightly concave, basal sclerite puncatate; mesial valve dilated apically.

Material Examined: Meghalaya, Shillong, Lumdaitkhla, 25-X-2008, on grasses, 14♀♀. Manipur, West Imphal, 15-X-2009, on grasses, 10♀♀.

Morphometry: (length in mm)

Female: Body length 33.72, Tegmina 26.93, Pronotum 2.61, Hind femur 22.79

Distribution: India: Tamil Nadu, Uttatr Pradesh, Assam, Manipur, Meghalaya, Kerala and Andhra Pradesh.

SUBFAMILY CATANTOPINAE BRUNNER, 1893

Catantopinae, Brunner. 1893. *Ann. Mus. Civ. Stor. Nat. Genova* **213**(33): 144.

Diagnosis: Body medium to large size; integument smooth; pronotum with median carina usually indistinct or obliterated, lateral carinae present or absent; prosternal process present; mesosternal interspace open, lobes rounded; tegmina and wings fully developed, rudimentary or absent; hind femur slender or stout, with lower basal lobe shorter than upper; hind tibia without external apical spine; arolium small or large. Male cercus straight, bent inwards; male subgenital plate without transverse folds; epiphallus, bridge narrow, undivided medially, ancorae and lophi present; aedeagus, basal and apical valves connected by flexure, basal valve with well developed gonopore process. Female ovipositor, outer dorsal margin of dorsal valve with small denticles spermatheca, apical diverticulum long and slender, pre-apical diverticulum tubular and crescent shaped.

The subfamily is represented by nine genera from this region. A key for their separation is given below:

Key to Indian genera of subfamily Catantopinae Brunner, 1893

1. Tegmina and wings rudimentary 2
--- Tegmina and wings fully developed 4

2. Median carina of pronotum cut by only posterior transverse sulcus .....
.....***Gerenia*** Stal, 1878

--- Median carina of pronotum cut by more than one transverse sulcus 3

3. Pronotum with lateral carinae absent .....
..... ***Apalniacris*** Ingrisch, Willemse & Shishodia, 2004

--- Pronotum with lateral carinae present or represented by points/ rounded ridges
..... ***Palniacris*** Henry, 1940

4. Lateral carina of pronotum absent 5

--- Lateral carina of pronotum present ..... ***Choroedocus*** Bolivar, I. 1914

5. Mesosternal lobes are wide and shorter 6

--- Mesosternal lobes long and narrow ..... ***Pachyacris*** Uvarov, 1923

6. Pronotum never constricted in middle..... 7

--- Pronotum at least slightly constricted in middle; prosternal process conical .....***Xenocatantops*** Dirsh, 1953

7. Frontal ridge sulcate; prosternal process laterally compressed.....
..... ***Stenocatantops*** Dirsh,1953

--- Frontal ridge flat or slightly depressed; prosternal process cylindrical or slightly antero-posteriorly compressed with rounded apex 8

8. Apex of cercus pre-apically expanded below, stocky to styliform .....
..... ***Diabolocatantops*** Jago, 1984

--- Apex of cercus pre-apically expanded above, with or without inner lobe or flange
..... ***Catantops*** Schaum, 1853

Genus *Catantops* Schaum, 1853

Catantops Schaum. 1853. *In Peters. Übersicht der von ihm in Mossambique beobachteten Orthopteren nebst Beschreibung der neu entdeckten Gattungen und Arten durch Hrn. Dr. Hermann Schaum. Ber. Akad. Wiss. Berlin* 779.

Type-species: *Catantops melanostictus* Schaum, 1853.

Diagnosis: Body small to medium size; antennae filiform, slightly compressed in basal fourth, as long as or shorter than head and pronotum together; fastigium of vertex

trapezoidal at apex; frons oblique, frontal ridge flat or slightly depressed with lateral carinulae obliterated; pronotum subcylindrical, never constricted in middle, median carina weak or obliterated, lateral carinae absent; metazona about as long as prozona, posterior margin obtuse angular; prosternal process cylindrical or slightly antero-posteriorly compressed, with rounded apex; mesosternal interspace slightly constricted; tegmina fully developed, reaching beyond apex of abdomen; hind femur slender or moderately slender; hind tibia without external apical spine; arolium large.

The genus is represented by a single species from this region.

***Catantops erubescens* (Walker, 1870)**

(Plate 50; Fig. 47)

Caloptenus erubescens Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* 4: 703.

Catantops erubescens (Walker); Kirby, W.F. 1914. *Fauna of British India, including Ceylon and Burma.* Orthoptera (Acrididae) 253.

Catantops erubescens (Walker); Uvarov, 1943a. *Ann. Mag. Nat. Hist:* 128.

Female genitalia: Supra-anal plate elongate, longer than wide, apex bluntly rounded, cercus broad basally, narrowing apically, twice as long as wide, apex blunt. Sub genital plate, posterior margin with a slight projection medially, serrated medially, setose laterally, egg-guide short, broad with rounded apex. Spermatheca, apical diverticulum narrower and shorter than pre-apical diverticulum, pre-apical diverticulum long, broad and recurved. ovipositor, dorsal valve as long as lateral apodeme, tips acute.

Material Examined: Arunachal Pradesh, East Siang, Pasighat, 3-II-2009, on grasses, 9♀♀.

Morphometry: (length in mm)

Female: Body 22.46, Tegmina 23.65, Pronotum 1.42, Hind femur 16.19

Distribution: India: Arunachal Pradesh and West Bengal.

Genus *Xenocatantops* Dirsh, 1953

Xenocatantops (Dirsh) In Dirsh & Uvarov, 1953. *Tijdschr. v. Entomologie* **96**: 237. Type-species: *Acridium humile* Serville, 1839.

Diagnosis: Generally resembling *Catantops* Schaum. Body of medium size; antennae slightly longer or shorter than head and pronotum together; fastigium of vertex with slightly raised carinulae between eyes; interocular distance narrower; frontal ridge more distinctly sulcate than in *Stenocatantops;* pronotum slightly constricted in prozona, posterior margin obtusangular; prosternal process acutely conical; mesosternal interspace open; tegmina and wings fully developed, reaching beyond apex of abdomen; hind femur less slender than in *Stenocatantops*, outer medial area of hind femur with transverse dark brown or black fasciae; external apical spine of hind tibia absent; arolium large.

The genus is represented by three species from this region. A key for their sepration is given below:

Key to the species of the genus *Xenocatantops* Dirsh &Uvarov, 1953

1. Lateral lobe of pronotum unicolorous, without black shining spots..... 2
--- Lateral lobe of pronotum in the upper part of the prozonal area with a shining black large spot; antennal joints short..... ***X. karnyi***, Kirby, 1910
2. Body large and more slender; tegmina projecting strongly beyond the hind knee; antennae longer than head and pronotum together, its median segment twice as long as broad; male cercus with apex simple ..... ***X. humilis***, Serville, 1838
--- Body small and less slender; tegmina projecting slightly beyond the hind knee; antennae as long as, slightly longer or shorter than head and pronotum together, its

median segment slightly longer than its width; male cercus with apex bidentate ..... ***X. brachycerus***, Willemse, 1932

***Xenocatantops humilis* (Serville, 1838)**

(Plate 51; Fig. 48)

Acridium humile Serville, 1838. *Histoire naturelle des insectes. Orthoptères* 662.

Caloptenus dominans Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 705. Syn. by Willemse, Fer M.H. 1968. *Monogr. Nederl. Ent. Vereenig.* **4**:56.

Caloptenus signatipes Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 631, 638, 706.

Catantops humilis (Serville); Stal. 1873. Recencio Orthopterorum. *Revue critique des Orthoptères décrits par Linné,* De Geer et Thunberg **1**: 71.

Catantops speciosus Brancsik. 1897. *Jahresh. Naturwiss. Ver. Trencsiner Comit.* **17**: 243-271.

Xenocatantops humilis humilis (Serville); Dirsh & Uvarov. 1953. *Tijdschr. v. Entomologie* **96**: 237.

Xenocatantops humils humilis (Serville); Willemse, F.M.H. 1968. *Monogr. Nederl. Ent. Vereenig.* **4**: 55, 58.

Xenocatantops humilis humilis , Tan, Ming Kai. 2010. *Nature in Singapore* **3**: 69.

Male genitalia: Supra-anal plate triangular, apex obtusely rounded, cercus elongate, curved, apex obtusely rounded; sub genital plate subconical; epiphallus, bridge moderately broad, undivided medially, ancorae curved, moderately large, lophi lobiform; aedeagus, apical valve narrower and much shorter than basal valve, basal valve broad.

Female genitalia: Supra-anal plate elongate, lateral margins serrate, narrowing apically, making a rounded apex, much longer than wide, cercus elongate, broad basally and narrowing apically, excurved, slightly less than three times as long as wide, apex pointed. Sub genital plate with posterior margin having a small conical projection

in middle, setose laterally; Jannone's organs present; egg-guide about two times as long as wide. Spermatheca with apical and pre-apical diverticulum long and narrow. Ovipositor with dorsal valve more than three times as long as wide, shorter than lateral apodeme, apical tip acute, dorsal edge serrated, ventral valve with apical tip long and pointed, slope deeply concave, basal sclerite narrow and smooth; mesial valve dilated apically.

Material Examined: Mizoram, Aizwal, Selesih, 9-II-2009, 10-II-2009 on grasses, 36♀♀, 14♂♂. Manipur, Ukhrul, 14-X-2009, on grasses, 8♀♀, 6♂♂. Nagaland, Dimapur, 20-X-2009, on grasses, 8♀♀, 5♂♂.

Morphometry: (length in mm)

Male: Body 20.65, Tegmina 20.0, Pronotum 1.5, Hind femur 13.68.

Female: Body 24.2, Tegmina 25.1, Pronotum 2.0, Hind femur 17.63

Distribution: India: Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Bihar, Chattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere: Bangladesh, Borneo, Indo-China, Java, Lombok, Malaysia, Mayanmar, Nepal, New Guinea, Philippines, Sumatra, Sri Lanka, Thailand, Tibet, Vietnam and Yuman.

Xenocatantops brachycerus (Willemse, 1932)

(Plate 52; Fig. 50)

Catantops brachycerus Willemse, C. 1932. *Natuurh. Maandbl.* **21**: 106.

Xenocatantops humilis brachycerus (Willemse); Dirsh & Uvarov. 1953. *Tijdschr. v. Entomologie* **96**: 237.

Xenocatantops humilis brachycerus (Willemse); F.M.H. 1968. *Monogr. Nederl. Ent. Vereenig.* **4**: 64.

Xenocatantops brachycerus, Cao, C. & Xiang-Chu Yin. 2007. *Acta Zootaxonomica Sin.* **32**(3): 523.

Female genitalia: Supra-anal plate broad, slightly longer than wide, apex rounded, cercus broad basally, narrowing apically, slightly more than twice as long as wide, apex bluntly rounded. Sub genital plate, posterior margin having a projection medially, setae on lateral margin only. Spermatheca, apical and pre-apical diverticuilum long and narrow. Ovipositor, dorsal valve elongate, slightly less than four times as long as wide, much longer than lateral apodeme, tips long and pointed; ventral valve with apical tip curved and pointed, basal sclerite narrow, mesial valve dilated apically.

Material Examined: Arunachal Pradesh, Seppa, East Kameng, 7-II-2009, on grasses, 13♀♀. Nagaland, Dimapur, 19-X-2009, on grasses, 8♀♀.

Morphometry: (length in mm)

Female: Body 22.35, Tegmina 23.22, Pronotum 1.63, Hind femur 15.14

Distribution: India: Nagaland, Sikkim and West Bengal.

Elsewhere: Bhutan, China, Nepal and Taiwan.

Xenocatantops karnyi (Kirby, 1910)

(Plate 53; Fig. 49)

Catantops karnyi Kirby, W.F. 1910. *A Synonymic Catalogue of Orthoptera* (Orthoptera Saltatoria, Locustidae vel Acridiidae) **3**(2): 483.

Catantops karnyi (Kirby); Kirby, W.F. 1914. *Fauna of British India, including Ceylon and Burma.* Orthoptera (Acrididae) 251.

Catantops karnyi (Kirby); Willemse, C. 1957. *Publ. natuurhist. Genootsch. Limburg* **10**: 474.

Xenocatantops karnyi, Nayeem & Usmani. 2012. *Munis Entomology & Zoology* 7(1): 403.

Male genitalia: Supra-anal plate elongate-angular, cercus elongate, narrowing apically with apex pointed. Sub genital plate short, subconical. Epiphallus, bridge narrow, undivided medially, ancorae short, triangular, lophi lobiform. Aedeagus, apical valve narrower and shorter than basal valve, basal valve long and slender.

Female genitalia: Supra-anal plate elongate, narrowing apically, apex rounded, much longer than wide, cercus elongate incurved, broad basally, narrowing apically, more than two and half times as long as wide, apex bluntly rounded. Sub genital plate, posterior margin with a slight projection medially, setose laterally, egg-guide elongate, slender with rounded apex. Spermatheca, apical diverticulum narrower and much shorter than pre-apical diverticulum, pre-apical diverticulum long, uniformly broad and recurved. Ovipositor, dorsal valve shorter than lateral apodeme, tips blunt.

Material Examined: Sikkim, Gangtok, Sichey, 14-X-2008, on grasses, 18♀♀, 13♂♂. Assam, Guwahati, Patorkuchi, 30-X-2008, on grasses, 14♀♀. Arunachal Pradesh, East Siang, Pasighat, on grasses, 15♀, 12♂♂.

Morphometry: (length in mm)

Male: Body length: 20.05, Tegmina: 17.81, Pronotum: 1.66, Hind femur: 12.6

Female: Body length: 26.00, Tegmina: 20.75, Pronotum: 2.05, Hind femur: 15.2

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Assam, Chattisgarh, Delhi, Himachal Pradesh, Maharashtra, Orissa, Tamil Nadu, Tripura, Uttarakhand and Uttar Pradesh.

Genus *Apalniacris* Ingrisch, Willemse & Shishodia, 2004

Apalniacris Ingrisch, F.M.H. Willemse & Shishodia. 2004. *Tijdschr. v. Entomologie* **147**: 296.

Type-Species: *Apalniacris dampha* Ingrisch, Fer M.H. Willemse & Shishodia, 2004.

Diagnosis: Head conical; anterior margin in lateral view concave. Antennae distinctly longer than head and pronotum together; basal segments of flagellum compressed and little widened. Frontal ridge projecting between antennae, shallowly furrowed, constricted at transverse facial furrow, indistinct below transverse facial furrow. Frons with some furrows and impressed dots but not really rugose; lateral facial keels distinct; subocular furrow very shallow; with an oblique furrow on genae; mandibles with a vertical carina parallel to posterior margin. Fastigium vertices shallowly impressed or furrowed in middle; with shallow foveolae; vertex with a low median carina. Pronotum rugose; lateral lobes in dorso-anterior area matte and in dorso-central area smooth and shining; disc somewhat roof shaped but not much raised, lateral margins angularly rounded into lateral lobes; anterior margin slightly convex at both side and weakly excised in middle; median carina distinct, cut by three transverse sulci, depressed at anterior margin; areas lateral of carina more or less bulging near anterior margin; posterior margin truncate or slightly angular or faintly convex at both sides, always angularly excised in middle, with a series of elongate tubercles. Squamipterous; tegmina lanceolate. Abdominal tympana large, one partly covered by tegmina. Prosternal spine conical, apex sub-acute. Mesosternal lobes wider than long; mesosternal interspace about as wide as or wider than long; metasternal lobes subcontiguous or separate in male, always separate in females. Hind femur moderately thick; dorso-median carina finely serrulate, terminating in a spinule; dorso-external area rugose; lateral areas shining; lower genicular areas obtuse. Hind tibia with 6-7 dorso-external and 9 dorso-internal spines, without dorso-external apical spine.

The genus is represented by a single species from this region.

Apalniacris shillong Ingrisch, Willemse & Shishodia, 2004

(Plate 54; Fig. 52)

Apalniacris shilling Ingrisch, Willemse & Shishodia, 2004. *Tijdschr. Voor Entomol.*, **147**: 300.

Male genitalia: Supra-anal plate varying between species. Paraproct with a large projection. Cerci modified, often strongly curved and apex compressed or widened. Sub genital plate short, conical. Epiphallus with lateral areas often distinctly curved ventrad. Phallus with aedeagal valves small; basal fold and ventral infold both with distinct sclerites, covering central part of phallus dorsally and ventrally.

Female Genitalia: Supra-anal plate long, triangular, with a median furrow in basal half and with an indistinct transverse fold in or behind middle of length; lateral areas sloping; apex obtuse. Cerci conical, often wide at base. Sub genital plate with sharp apical margin varying between species. Spermatheca apical diverticulum shorter than pre-apical diverticulum, pre-apical diverticulum well developed. Ovipositor short, margins without teeth, apices of valves hooked; ventral margins of dorsal valves and dorsal margin of basivalvular sclerite with long hairs.

Material Examined: Meghalaya, Nongstoin, 15-I-2011, on grasses, 12♀♀, 10♂♂; Tyrsad, 24-X-2009, on grasses, 11♀♀.

Morphometry: (length in mm)

Male: Body 19.05, Tegmina Brachycerus, Pronotum 1.87, Hind femur 10.15

Female: Body 22.23, Tegmina Brachycerus, Pronotum 2.72, Hind femur 14.41

Distribution: India: Meghalaya.

Genus *Palniacris* Henry, 1940

Palniacris Henry, 1940. *Trans. R. Entomol. Soc. London* **90**(19): 529.
Type-Species: *Palniacris maculatus* Henry, 1940.

Diagnosis: Body robust and of medium size; antennae filiform, slightly thickened beyond middle, longer than head and pronotum together; vertex only slightly convex, in the middle with the indication of a median carinula; frontal ridge sulcate; pronotum gradually widened posteriorly, median carina distinct of uneven development, lateral carinae more or less indicated by a row of impressed points widening posteriorly; metazona much shorter than prozona, posterior margin straight, with a strong triangular incision in the middle; prosternal process conical, at apex slightly curved anteriorly, apex subacute; mesosternal interspace open; tegmina rudimentary, lateral, spathulate, only reaching the hind margin of metanotum; wings absent; hind femur thick, upper carina serrate and terminating into a sharp tooth; external apical spine of hind tibia absent.

The genus is represented by a single species from this region.

Palniacris rugulosa (Bolivar, 1902)

(Plate 55; Fig. 51)

Bibracta rugulosus Bolivar, 1902. *Annls. Soc. Ent. Fr.*, **70**: 620.
Bibracta rugulosus (Bolivar); Kirby, 1914. *Fauna Brit. India, Orth.*,: 235.
Palniacris rugulosus (Bolivar); Henry, 1940a. *Trans. R. ent. Soc. London*, **90**: 531.
Palniacris rugulosus (Bolivar); Tandon, 1976. *Rec. zool. Surv. India, Occ. Pap. No.*, **3**: 18.

Female genitalia: Supra-anal plate broad, as long as wide, apex broadly rounded. Cercus short and broad, narrow at apex, two times as long as wide, apex blunt. Sub genital plate lateral margins straight, posterior margin convex medially, setose laterally,

jannone'organ present with two brown spot. Egg-guide moderately broad, two times as long as wide, apex rounded. Spermatheca apical diverticulum long and slender of uniform width. Pre-apical diverticulum short, broad at apex. Ovipositor dorsal valve moderately broad, dorsal edge slightly serrated, apex blunt, shorter than lateral apodeme, ventral valve moderately broad, slender, concave medially. Mesial tooth distinct, apex blunt.

Material Examined: Meghalaya, Shillong, Tyrsad, 24-X-2008, on grasses, 15♀♀.

Morphometry: (length in mm)

Female: Body 20.4, Pronotum 4.7, Hind femur 12.7

Distribution: India: Meghalaya.

Genus *Gerenia* Stal, 1878

Gerenia Stal, 1878. *Bihang Kungl. Svenska Vet. Akad. Handl.* **5**(4): 28, 73.

Type-species: *Gerenia obliquenervis* Stal, 1878.

Diagnosis: Body robust and of mediun size, integument finely and more rugosely punctured; antennae filiform, relatively thick, slightly widened apically, as long as or longer than head and pronotum together; fastigium of vertex sloping, not projecting between the antennae; dorsum of pronotum tectiform, median carina distinct, slightly raised, crossed by three transverse sulci, lateral carinae absent; metazona shorter than prozona, posterior margin not or only slightly widened; prosternal process straight, conical, apex more or less pointed; mesosternal interspace open; tegmina and wings shortened; hind femur short, rather thick.

The genus is represented by a single species from this region.

Gerenia pustulipennis (Walker, 1871)

(Plate 56; Fig. 53)

Caloptenus pustulipennis Walker, F. 1871. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum Supplement*: 68.

Gerenia pustulipennis (Walker); Kirby, 1910. *A Synonymic Catalogue of Orthoptera* (Orthoptera Saltatoria, Locustidae vel Acridiidae), **3**(2): 472.

Female genitalia: Supra-anal plate broad, as long as wide, apex bluntly rounded, cercus broad basally, narrowing apically, almost twice as long as wide, apex blunt. Sub genital plate with deep projections laterally and serrated, egg-guide abruptly narrowing apically with pointed apex. Ovipositor valves short and robust, dorsal valve more than three times as long as wide, slightly shorter than lateral apodeme, apex blunt; ventral valve with apex short and acute, basal sclerite broad and smooth.

Material Examined: Assam, Lakhimpur, North Lakhimpur, 27-X-2008, on paddy field, 4♀♀. Assam, Guwahati, Bongra, 28-X-2008, on paddy field, 8♀♀.

Morphometry: (length in mm)

Female: Body 21.76, Prónotum 1.8, Hind femur 12.99

Distribution: India: Maharashtra.

Genus *Diabolocatantops* Jago, 1984

Diabolocatantops Jago, 1984. *Trans. Amer. Entomol. Soc.* **110**(3): 295.

Type-Species: *Gryllus axillaris* Thunberg (= *Diabolocatantops axillaris axillaris*), 1815.

Diagnosis: It is closely related to *Catantops* Schaum, 1853, but differs distinctly in male genital characters. Aedeagal valves depressed dorso-ventrally, oblique, small and folaceous. Singular rami wrapping around valves, strongly appressed bilaterally, forming scletoritised pod-like ventral protection to aedeagus. Epiphallus large, heavily

sclerotised in mature males, with large rounded lophi and parabolic to narrow slot-like lophal interspace. Lophi viewed edge-on concavely curved below. Ventro-lateral angles of epiphallus weak. Ancorae large and forwardly decurved. Cercus with bilaterally flattened apex with some trace of upcurved tip with ventro-apical process. Ectophallic membrane dorsally very thin, transversely wrinkled, not medially grooved. Cingular rami lacking lateral button-like nodules. Medium to large species with tendency to uniformly pigmented light brown pronotum or pronotum with side lobes uniformly dark brown. Light colour of episternum III weakly differentiated (except in Malagasy species). Hind femora crimson to dull orange internally with two clear dark transverse bars dorsally and inner basal black spot proximally. Hind tibiae orange or red, at least on inner side. Hind femora with outer area immaculate except for small dorsal median black spot or bar, sometimes supplemented by additional small dorsal one distally of similar size.

The genus is represented by a single species from this region.

Diabolocatantops consobrinus (Karny, 1907)

(Plate 57; Fig. 54)

Diabolocatantops consobrinus, Karny. 1907. S.B. *Akad. Wiss. Wien, Math.-Nat. Kl.* (Abt. 1) **116**: 341.

Diabolocatantops consobrinus, Jago. 1984. *Trans. Amer. Entomol. Soc.* **110**(3): 371.

Female genitalia: Supra-anal plate as long as wide, lateral margin diverging posteriorly, apex rounded. Cercus broad, slightly more than two times as long as wide, apex rounded. Sub genital plate lateral margin straight, posterior margin wavy, smooth, jannone's organ present with two small spots. Egg-guide broad basally narrowing apically with rounded apex, slightly more than two times as long as wide. Spermatheca with apical and pre-apical diverticulum long, slender of almost same size. Ovipositor

dorsal valve robust, broad, apex rounded, dorsal edge deeply concave, slightly longer than lateral apodeme, ventral valve long, slender,apex blunt, mesial tooth distinct, basal sclerite developed triangular.

Material Examined: Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 12♀♀.

Mizoram, Aizwal, Selesih, 8-II-2009, on grasses, 19♀♀.

Morphometry: (length in mm)

Female: Body length: 38.53, Tegmina: 36.91, Pronotum: 2.81, Hind femur: 21.17

Distribution: India: Arunachal Pradesh and Mizoram.

Genus *Stenocatantops* Dirsh, 1953

Stenocatantops Dirsh, 1953. In Dirsh & Uvarov. *Preliminary diagnoses of new genera and new synonymy in Acrididae. Tijdschr. v. Entomologie* **96**: 237.

Type-species: *Gryllus splendens* Thunberg, 1815.

Diagnosis: General appearance similar to *Catantops* Schaum but more slender; antennae filiform, longer or shorter than head and pronotum together; fastigium of vertex with indistinct carinulae; frons moderately sloping backwards; frontal ridge sulcate; dorsum of pronotum flattened, not constricted in middle, median carina low, lateral carinae absent; prosternal process more or less distinctly compressed laterally; mesosternal interspaces strongly constricted; tegmina and wings fully developed, extending at least slightly beyond hind knees; hind femur slender, hind tibia slightly expanded and incurved distally, external apical spine of hind tibia absent.

The genus is represented by a single species from this region.

Stenocatantops splendens (Thunberg, 1815)

(Plate 58; Fig. 55)

Gryllus splendens Thunberg, 1815. *Mem. Acad. Imp. Sci. St. Peterburg* **5**: 236.

Acridium luteolum Serville. 1838. *Histoire naturelle des insectes. Orthoptères* 661.

Cyrtacanthacris ferrina Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **3**: 568. Syn. by Bolívar, Ignacio. 1917[1918]. *Rev. Real Acad. Cienc. Exact., Fisic. Natur.* **16**: 406.

Acridium ceramicum Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **3**: 591. Syn. by Bolívar, Ignacio. 1917[1918]. *Rev. Real Acad. Cienc. Exact., Fisic. Natur.* **16**:406.

Cyrtacanthacris oblique Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 618.

Stenocatantops splendens Tan, Ming Kai. 2012. Orthoptera in the Bukit Timah and Central Catchment Nature Reserves (Part 1): Suborder Caelifera 5.

Female genitalia: Supra-anal plate slightly longer than wide, rounded posteriorly. Cercus broad, two times as long as wide and obtusely rounded at apex. Sub genital plate widended posteriorly, posterior margin concave either side of egg-guide and setose. Egg-guide elongate, narrow at apical and posterior end and broad medially, three times as long as wide, apex pointed. Spermatheca both apical and pre-apical diverticula long, narrow and curved. Apical diverticulum slightly long than pre-apical diverticulum. Ovipositor dorsal valve broad, dorsal edge serrated, apex obtusely longer and significantly shorter than lateral apodeme, ventral valve moderately broad, apical tip blunt, basal sclerite well developed triangular.

Material Examined: Sikkim, Mangan, North District, 16-X-2008, on grasses, 17♀♀. Manipur, West Imphal, 15-X-2009, on grasses 9♀♀. Nagaland, Wokho, Marigaon, 20-X-2009, on grasses 6♀♀.

Morphometry: (length in mm)

Female: Body 36.01, Tegmina 35.76, Pronotum 2.73, Hind femur 19.1

Distribution: India: Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Madhya Pradesh, Meghalaya, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal.

Elsewhere: Borneo, Celebes, China, Hainan, Java, Korea, Malaysia, Moluccas, Myanmar, Philippines, Sri Lanka, Sumatra and Thailand.

Genus *Pachyacris* Uvarov, 1923

Pachyacris Uvarov, 1923. *Ann. Mag. nat. Hist.* 9(11): 140.
Type-species: *Acridium violascens* Walker, 1870.

Diagnosis: Body of large size; integument rugosely punctured; antennae filiform, as long as or slightly longer than head and pronotum together; fastigium of vertex subhexagonal, sloping; frontal ridge broad and impressed, sulcate below median ocellus; pronotum crossed by three transverse sulci, median carina distinct, lateral carinae absent; metazona as long as prozona, posterior margin angular; prosternal process short, subconical, straight, apex obtuse; mesosternal interspace open, lobes rectangular; tegmina fully developed, apex obliquely truncated, veinlets in the apical part with regular oblique feather like reticulation (Willemse, 1957); hind femur with lower basal lobe shorter than upper; external apical spine of hind tibia absent.

The genus is represented by a single species from this region.

Pachyacris violascens (Walker, 1870)

(Plate 59; Fig. 56)

Acridium violascens Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **3**: 587.

Orthacanthacris violascens (Walker); Kirby, 1914. *The Fauna of British India, including Ceylon and Burma.* Orthoptera (Acrididae): 229.

Pachyacris violascens (Walker); Uvarov. 1923. *Ann. Mag. nat. Hist.* 9(11): 478.

Female genitalia: Supra-anal plate broad, as long as wide, apex blunt, cercus elongate, narrow, broad at base, twice as long as wide, apex bluntly rounded. Sub genital plate with posterior margin notched medially, setose laterally. Spermatheca with apical diverticulum narrower and longer than pre-apical diverticulum, pre-apical diverticulum uniformly broad and curved. Ovipositor valves elongate, slender with apical tips elongate and blunt, dorsal valve four times as long as wide, shorter than lateral apodeme, dorsal condyle prominent; ventral valve curved, basal sclerite prominent and smooth, mesial valve dilated apically.

Material Examined: Mizoram, Chimtuipui, Saiha, 12-II-2009, on grasses, 4♀♀.

Morphometry: (length in mm)

Female: Body length 44.94, Tegmina 48.11, Pronotum 4.15, Hind femur 27.71

Distribution: India: Andhra Pradesh, Bihar, Himachal Pradesh, Kerala, Orissa and Tamil Nadu.

Elsewhere: Sri Lanka.

Genus *Choroedocus* Bolivar, 1914

Choroedocus Bolivar, 1914. *Trab. Mus. Cienc. nat., Madrid (Ser. zool.)* **20**: 8.

Type-species: *Demodocus capensis* Stal, 1878.

Diagnosis: Body of large size; antennae filiform, longer than head and pronotum together; fastigium of vertex ovate, concave, with a complete or incomplete median carinula; frontal ridge with the margins sub parallel or slightly widened towards the clypeus, its surface finely punctuate and impressed at the median ocellus; dorsum of pronotum flat, crossed by three transverse sulci, median and lateral carinae distinct,

metazona about as long as prozona, posterior margin rounded; prosternal process long and cylindrical, curved backwards; mesosternal interspace open, narrow; tegmina and wings fully developed; hind femur slender; hind tibia with sparse spines, external apical spine absent; apex of male abdomen inflated. Male: supra anal plate large, impressed; cercus very large, flattened and compressed, slightly incurved; subgenital plate conical, slightly recurved, hairy, apex truncate, subtruncate or rounded. Female: subgenital plate, posterior margin broadly rounded, setose, egg-guide short; ovipositor, dorsal valve much shorter than lateral apodeme, apical tip acutely pointed; spermatheca, apical diverticulum of uniform width, shorter than pre-apical diverticulum which is much broader.

The genus is represented by a single species from this region.

***Choroedocus robustus* (Serville, 1838)**

(Plate 60; Fig. 57)

Acridium robustum Serville, 1838. *Histoire naturelle des insectes. Orthoptères* 647.

Heteracris ducalis Walker, F. 1870. *Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum* **4**: 655.

Heteracris robustus (Serville); Kirby, 1914. *The Fauna of British India, including Ceylon and Burma.* Orthoptera (Acrididae): 262.

Heteracris robustus (Serville); Uvarov, 1921c. *Trans. Ent. Soc. Lond*: 109.

Heteracris robustus (Serville); Tandon, 1976. *Newsl. Zool. Surv. India*: 13.

Male genitalia: Supra-anal plate large, impressed; cercus very large, flattened and compressed, slightly incurved. Sub genital plate conical, slightly recurved, hairy, apex truncate, subtruncate or rounded. Epiphallus bridge shaped, bridge undivided, ancorae well developed, narrowing apically, apex curved and pointed lophi absent. Aedeagus apical valve elongate narrow, longer than basal valve, apex pointed, basal valve short and broad basally.

Female genitalia: Supra-anal plate elongate, broad basally, narrowing apically, longer than wide, apex rounded; cercus elongate, twice as long as wide, apex conical. Sub genital plate with posterior margin serrated; posterior marginal setae and Jannone's organs absent; egg-guide small, twice as long as wide. Spermatheca with apical diverticulum of uniform width, shorter than the pre-apical diverticulum which is much broader. Ovipositor with dorsal valve slightly less than three times as long as wide, much shorter than lateral apodeme, apical tip short and pointed, dorsal edge faintly serrated; ventral valve with apical tip short and blunt, slope not much curved, basal sclerite tuberculate at apical half; mesial valve dilated apically.

Material Examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 14♀♀, 12♂♂. Manipur, Tamenglong, 15-X-2009, on grasses, 7♀♀, 5♂♂. Nagaland, Dimapur, 20-X-2009, on grasses 5♀♀, 5♂♂.

Morphometry: (length in mm)

Male: Body length 42.19, Tegmina 39.46, Pronotum 3.89, Hind femur 28.41

Female: Body length 66.89, Tegmina 57.7, Pronotum 4.15, Hind femur 45.56

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Tripura and West Bengal.

Elsewhere: Bangladesh.

Diversity of Acrididae in North-Eastern states of India

A critical analysis on the distribution of genera and species belonging to various subfamilies of Acrididae in the present work reveals that the genera and species are widely distributed in different regions of North-Eastern states of India. During this study a total of fifty seven species belonging to fourty one genera distributed in ten subfamilies were recorded from eight North-Eastern states of India. From these subfamilies, one genus and two species were recorded as new to science.

Among these states Meghalaya with 360 specimens, was found to be the most diverse state represented by ten subfamilies with twenty four species belonging to twenty one genera. Further in Meghalaya Subfamily Oxyinae (26%) was the most diverse among the subfamilies, followed by Gomphocerinae (22%), Catantopinae (13%), Acridinae and Oedipodinae (9% each), Spathosterninae (5%), Coptacridinae, Cyrtacanthacridinae, Eyprepocnemidinae and Tropidopolinae (4% each) (Fig. 59). One genus and two species were recorded as new to science from this state.

From Manipur 145 specimens were collected from different localities. These specimens were represented by seventeen species and fourteen genera grouped under seven subfamilies, among which subfamily Oxyinae (38%) was most diverse followed by Oedipodinae, Catantopinae (18% each), Acridinae (17%), Eyprepocnemidinae, Spathosterninae and Tropidopolinae (6% each) (Fig. 59). From Arunachal Pradesh 219 specimens of Acrididae from various localities of the state belonging to five subfamilies, twelve genera and sixteen species were collected. Among the five subfamilies, subfamily Oedopodinae (44%) was found to be the most diverse followed by Acridinae (25%), Catantopinae (19%), Spathosterninae and Oxyniae (6% each) (Fig. 58).

Assam was represented by 150 specimens of grasshoppers and locusts, belonging to fourteen species and twelve genera grouped under seven subfamilies. Further, subfamily Oxyinae was most diverse with 29% of species composition followed by Acridinae (22%), Gomphocerinae & Oedipodinae (14% each) and Catantopinae, Cyrtacanthacridinae & Spathosterninae (7% each) (Fig. 58). From Nagaland 125 specimens of Acrididae were collected from different localities. The collected specimens were grouped under six subfamilies, eleven genera and fourteen species. The highest species composition was represented by subfamily Oxyinae (38%), followed by Catantopinae (31%), Cyrtacanthacridinae, Spathosterninae & Tropidopolinae (8% each) and Oedipodinae (7%) (Fig. 60).

Survey of Mizoram state results in the collection of 145 specimens which were represented by four subfamilies, eight genera and eight species. Among the four subfamilies, subfamily Oedipodinae (37%) was most diverse followed by Acridinae & Catantopinae (25% each) and Tropidopolinae (13%) (Fig. 60). From Tripura a total of 95 specimens were collected. These specimens were distributed under five subfamilies, five genera and seven species. Among the five subfamilies, Acridinae and oxyinae (29% each) were more dominant as compared to Coptacridinae, Oedipodinae and Tropidopolinae (14% each) (Fig. 61). Sikkim being the smallest state of the North-Eastern region and having relatively harsh climate in respect to other states it shows lowest diversity in this region represented by 83 specimens only, belonging to four subfamilies, six genera and seven species. Subfamily Acridinae (43%) was most dominant, followed by Catantopinae (29%), Spathosterninae and Oedipodinae (14% each) (Fig. 61).

Table 1: Distribution of Grasshopper species in North-Eastern states of India

Subfamily	Species	States							
		Arunachal Pradesh	Tripura	Meghalaya	Assam	Mizoram	Sikkim	Manipur	Nagaland
GOMPHOCERINAE	*Brachycrotaphus longiceps*				+				
	Leva indica			+					
	Dociostaurus (D.) apicalis			+					
	Chorthippus indus			+					
	Aulacobothrus taeniatus			+					
	Aulacobothrus l. luteipes				+				
	Leinotacris bolivari			+					
ACRIDINAE	*Acrida exaltata*	+			+			+	
	Acrida gigantea	+			+				
	Phlaeoba infumata	+	+	+		+		+	
	Phlaeoba panteli		+	+			+	+	+
	Phloeba angustidorsis				+		+		
	Phloeba tenebrosa	+							
	Orthochtha indica			+		+	+		
OEDIPODINAE	*Sphingonotus c. caerulans*	+							
	Sphingonotus r. rubescens	+							
	Trilophidia annulata	+		+	+	+		+	+
	Trilophidia repleta	+							
	Atolopus t. thalassinus	+							
	Atolopus t. tamulus				+				
	Ceracris deflorata						+		
	Ceracris nigricornis			+					
	Heteropternis respondens	+				+		+	
	Diitopternis venusta	+						+	
	Chloebora marschalli					+			
	Scinthurista notabilis		+					+	
OXYINAE	*Gesonula punctifrons*				+			+	+
	Oxya fuscovittata	+		+	+				+
	Oxya japonica viticoliss			+					

	Oxya velox		+					+	+
	Oxya chinensis				+				
	Oxya hyla hyla		+					+	+
	Caryanda paravicina			+				+	+
	Cercina mussoriensis				+				
	Lemba elongata sp. n.			+					
	Lemba motinagar			+					
	Pseudoxya dimunata			+					
SPATHOSTERNINAE	*Spathosternum p. prasiniferum*	+		+	+		+	+	+
TROPIDOPOLINAE	*Neooxyrhepes meghalayensis* gen n., sp. n			+					
	Oxyrrhepes obtusa					+		+	+
	Tristria pulvinata		+						
CYRTACANTHACRIDINAE	*Chondracris rosea*			+					+
	Patanga succinata				+				
COPTACRIDINAE	*Eucoptacra praemorsa*			+					
	Epistaurus aberrans		+						
EYPREPOCNEMIDINAE	*Eyprepocnemis alacris alacris*			+				+	
CATANTOPINAE	*Catantops erubescens*	+							
	Xenocatantops humilis					+		+	+
	Xenocatantops brachycerus	+							+
	Xenocatantops kamyi						+		
	Apalniacris shillong			+					
	Palniacris rugulosa			+					
	Gerenta pustulipennis				+				
	Diabolocatanops consobrinus	+							
	Stenocatantops splendens						+	+	+
	Pachyacris violascens					+			
	Choroedocus robustus			+				+	+

Discussion

Earlier studies on the systematics of Indian Acrididae are exclusively based on the external characters like colour, size, texture, number of antennal segments etc. Beside conventional characters, in the present study attempt has also been made to make a comperhensive study on the genitalic structures, viz., supra-anal plate and cerci, subgenital plate, epiphallus and aedeagus of male; sub genital plate, supra-anal plate and cerci, ovipositor and spermatheca of female. Significance of conventional and genitalic structures in the classification of Indian Acridoidea is shown.

Significance of conventional and genitalic structures in the classification of Indian Acridoidea:

Presence or absence of fastigial furrow; presence or absence of prosternal process; length of lower basal lobe in relation to upper basal lobe of hind femur; shield or bridge-shaped condition of epiphallus; presence or absence of dorso-lateral appendices, oval sclerites and lophi on epiphallus; divided, undivided or flexured condition of aedeagus; presence or absence of gonopore process on aedeagus; condition of apical and pre-apical diverticula of spermatheca; presence or absence of glandular pouches of Comstock and Kellog on female subgenital plate; rudimentary or well developed condition of egg-guide are taken as distinct family characters.

Vertical or oblique condition of frons, presence or absence of lateral carinae on pronotum; presence or absence of intercalary vein on tegmina; presence or absence of stridulatory serration on innerside of hind femur, presence or absence of teeth or tubercles on upper side of middle tibia, presence or absence of external apical spine of hind tibia; open or closed condition of mesosternal interspace, rounded or rectangular condition of mesosternal lobes; presence or absence of tooth on apex of male cercus ; presence or absence of ancorae on epiphallus, long or short condition of aedeagal sclerites; elongate, slender or short and broad condition of ovipositor valves: presence

or absence of Jannone's organs and setae on posterior margin of female subgenital plate; shape of diverticula of spermatheca are regarded as stable characters for separating the subfamilies.

Acute or obtuse angle of vertex, frons sulcated or flattened condition of frontal ridge, ratio of width of interocular distance and frontal ridge, presence or absence of fastigial foveolae and carinulae on vertex, condition of antennae, shape and ratio of length and width of pronotum, presence or absence of X-shaped pattern on pronotum, ratio of length of metazona and prozona of pronotum, presence or absence of median and lateral carinae on pronotum, number of transverse sulci crossing dorsum of pronotum, slightly or deeply incised condition of pronotal crest, bidentate or trilobate condition of median carina in prozona; shape of prosternal process abruptly excised condition; length of inner hind tibial spurs in relation to external spurs and basal tarsal segment, shape of tegmina; presence or absence of fascia on hind wings; shape of male subgenital plate, supra-anal plate and cerci, broad or narrow condition of bridge, presence or absence of branch of bridge connecting lophi with bridge of epiphallus; mono, bi or trilobate condition of lophi of epiphallus, length and upcurved or downcurved condition of apical valve of aedeagus, shape of posterior margin of female subgenital plate, presence of setae on the whole posterior margin or confined to lateral margins only; toothed, tuberculate or smooth condition of ovipositor valves, length of the lateral apodeme in relation to the dorsal valves are suggested as useful generic characters.

Body colour, sculpture, presence or absence and number of tubercles on pronotum, shape of egg-guide of female subgenital plate, shape of ovipositor valves and apical tips, shape of male supra-anal plate and cerci, size of anterior and posterior lobes of lophi of epiphallus, size and shape of ancorae, shape of apical valves of

aedeagus; size of apical and pre-apical diverticula and presence of protuberance on pre-apical diverticulum are taken as specific characters.

A comparative study of the genitalic structures particularly epiphallus, aedeagus and spermatheca makes it possible to put forward some suggestions regarding interrelations of families and subfamilies of Acrididae more clearly than the external characters.

Subfamilies Catantopinae, Coptacridinae, Cyrtacanthacridinae, Eyprepocnemidinae, Tropidopolinae, Calliptaminae and Eremogryllinae are so closely related that earlier and recent workers have put all of them in one group. In all the subfamilies apical and pre-apical diverticula of spermatheca are tubular. The grouping is justified not only by the common character of spermatheca but also by the fact that all the subfamilies possess prosternal process.

The subfamilies Cyrtacanthacridinae, Calliptaminae and Catantopinae are closely related in having spermatheca with long and slender apical diverticulum, whereas in the subfamilies Eyprepocnemidinae and Tropidopolinae, spermatheca with apical diverticulum moderately long and slender. The spermatheca with a short, rudimentary and sometimes absent apical diverticulum and sac-like pre-apical diverticulum in the subfamily Acridinae.

There are two main trends of specialization of epiphallus in this group: (1) The most primitive shield-like epiphallus is found in Pamphagidae and (2) Bridge-shaped epiphallus in the families Pyrgomorphidae and Acrididae. Therefore, Pamphagidae should be regarded as the most primitive family among this group. Moreover dorso-lateral appendages articulated with bridge of epiphallus in Pyrgomorphidae and oval sclerites of epiphallus in Acrididae are most characteristic features whereas in

Pamphagidae, the epiphallus is devoid of any of these structures. Beside the primitive epiphallus, Pamphagidae show primitiveness in having aedeagal sclerites completely divided while it is contiguous in Pyrgomorphidae and flexured in Acrididae.

Bridge-shaped condition of epiphallus and sac-like condition of pre-apical diverticulum of spermatheca are regarded as advanced characters. These occur in the subfamilies Acridinae, Oedipodinae, Truxalinae and Gomphocerinae. Gomphocerinae is regarded as the most advanced subfamily among the group (Uvarov, 1966).

The North-Eastern part of India comprising of eight states is one the most important biodiversity hotspot in India and world. Most of the North-Eastern states have more than 60% of their geographical area under forest cover. The hotspot is, the second largest and next only to the Mediterranean basin with an area 2,20,60,000 km^2 among the 25 identified global hotspots of biodiversity. This region is full of diversity of various insects. In present study ten subfamilies (Gomphocerinae, Acridinae, Oedipodinae, Oxyinae, Spathosterninae, Tropidopolinae, Cyrtacanthacridinae, Coptacridinae, Eyprepocnemidinae and Catantopinae) belonging to the family Acrididae were recorded from these states. Both generic and sub-familial diversity have been studied.

Meghalaya represents the most diverse state in having most number of specimens as well as number of genera while the least number of specimens and genera were recorded from Tripura and Sikkim. While other states were represented by moderate number of genera belonging to different subfamilies. This may be attributed to the fact that Meghalaya is having the higher forest cover area as well as grasslands as compared to other states. Extensive surveys of these areas were made which results in good diversity as depicted in the results.

At sub-familial level Oxyinae was found to be the most diverse subfamily in Assam, Manipur, Meghalaya, Nagaland and Tripura this may be due to the fact that the members of this subfamily prefer feeding on paddy cultivation and grasses, which are prevalent during the survey period. Subfamily Oxyinae was absent in Mizoram and Sikkim. Gomphocerinae was represented by five genera in Meghalaya, two genera in Assam while in other states it was completely absent. Acridinae was present in all states except Nagaland. Oedopodinae was represented by all states highest being in Arunacnal Pradesh and lowest in Sikkim, Tripura and Nagaland. Spathosterninae was represented by one genus in all states except Mizoram and Tripura where it was completely absent. Tropidopolinae was also represented by one genus except in Arunachal Pradesh, Sikkim and Assam. Other less represented sub-families were Cyrtacanthacridinae, Coptacridinae and Eyprepocnemidinae. Cantantopinae was absent in Tripura, while the number of genera was highest in Nagaland. This may be explained as different genera require different type of conditions for their survival and the variable number of genera in different states can be explained on the same basis.

Shannon's diversity index is used for estimating diversity of regions. In present study Shannon's diversity was calculated at genus level. It was found to be highest in Meghalaya, followed by Manipur, Arunachal Pradesh, Assam, Nagaland, Sikkim and Tripura. The fluctuations in diversity index can be well explained on the basis of number of genera in different states.

Margelef's diversity was highest in Meghalaya, followed by Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim and Tripura. (Fig. 62 and Table 1).

Summary

The family Acrididae includes locusts and grasshoppers which are major pests of agricultural and grazing lands throughout the world, and are well known for their destructiveness. Keeping in view the economic importance of these pests, it was decided to carry out a comprehensive plan of collecting and identifying the acrido-fauna of North-Eastern States of India. The study is mainly based on conventional morphological and genitalic structures.

The studies on the taxonomy of locusts and grasshoppers (Acrididae) of North-Eastern states of India could be summarized as follows:

1. The subdivision of the superfamily Acridoidea into families, subfamilies, tribes and groups as adopted by earlier authors is discussed. In present study family Acrididae is treated as distinct family with Catantopinae as its subfamily.

2. The present study is based on the fresh material collected during the course of survey (2008-2011) from various agricultural areas of different States of North-Eastern regions of India.

3. The North-Eastern states surveyed during this study are as follows: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. Topography of states is also provided.

4. The survey yielded a good number of specimens (1,347) belonging to the family Acrididae. The collected specimens were identified up to the species and subspecies level. This represents the first systematic collection of locusts and grasshoppers from the area.

5. In addition to systematic studies, observations were also made on the distribution and diversity of the acridoid fauna. Each sample collected and all specimens are recorded with bio-ecological observations and other relevant data. This makes the collected

material extremely valuable. In terms of published documentation, the Acridid fauna of North-Eastern states of India is poorly known. However, collection of Acridid fauna during the past three years results in an excellent representation of the Acrido-fauna from all states of North-East India. All the specimens were preserved and deposited in the museum collection of the Department of Zoology, Aligarh Muslim University, Aligarh.

6. In the present work, 360 specimens of Acrididae were collected from Meghalaya belonging to ten subfamilies, twenty one genera and twenty four species. One genus and two species were recorded as new to science from this region. 219 specimens of locusts and grasshoppers from Arunachal Pradesh were collected. Sixteen species belonging to five subfamilies and twelve genera have been recorded. 172 specimens of Acrididae from Mizoram represent eight species belonging to eight genera and four subfamilies. 150 specimens of locusts and grasshoppers from Assam belonging to seven subfamilies, twelve genera and fourteen species were collected. One species is recorded as new to science from this state. From Manipur, 145 specimens of Acrididae were collected belonging to seventeen species, fourteen genera and seven subfamilies. Nagaland, Tripura and Sikkim were represented by 123, 95 and 83 specimens respectively from each state.

7. Shannon's diversity index and Margelef's diversity index were used for estimating diversity of regions. Meghalaya was found to be the most diverse state when Shannon's diversity index and Margelef's diversity were calculated at genus level. In present study Shannon's diversity found to be highest in Meghalaya, followed by Manipur, Arunachal Pradesh, Assam, Nagaland, Sikkim and Tripura. The fluctuations in diversity index can be well explained on the basis of number of genera in different

states. Margelef's diversity index was highest in Meghalaya, followed by Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim and Tripura.

8. Altogether, a total of fifty seven species belonging to fourty one genera distributed in ten subfamilies were recorded from eight North-Eastern states of India. From these subfamilies, one genus and two species were recorded as new to science.

9. The present study is based on the conventional as well as genitalic characters. A detailed comparative study on genitalic structures viz., supra-anal plate and cerci, subgenital plate, epiphallus and aedeagus of male; subgenital plate, supra-anal plate and cerci, ovipositor and spermatheca of female was carried out. Significance of these characters in the classification of Acridoidea is shown.

10. Taxonomic significance of epiphallus and spermatheca in various families and subfamilies of Acridoidea is already known. However, the available literature shows that the taxonomic significance of supra-anal plate and subgenital plate has not been shown. In the present work significance of these characters in Acrididae is shown for the first time. Shield or bridge-shaped condition of epiphalius; presence or absence of dorso-lateral appendices. Oval sclerites and lophi on epiphallus; divided, undivided or flexured condition of aedeagus; presence or absence of gonopore process on aedeagus; long or short condition of apical and tubular or sac-like condition of pre-apical diverticula of spermatheca are taken as stable characters for separating various subfamilies.

11. Presence or absence of ancorae on epiphallus; long or short condition of aedeagal sclerites; long or short condition of ovipositor valves; shape of diverticula of spermatheca; presence or absence of Jannone's organs and setae on posterior margin of female subgenital plate are used for separating subfamilies. Long or short condition of ancorae on epiphallus, broad or narrow condition of bridge, mono, bi or trilobate

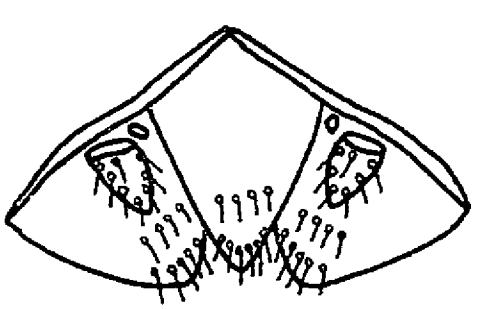
condition of lophi, upcurved or downcurved condition of apical valves of aedeagus, apical valve longer or shorter than basal valve; shape and length of basal and apical valves of aedeagus; length of ovipositor valves in relation with the lateral apodeme, shape of male and female supra-anal plate and cerci, shape of male subgenital plate as a whole and shape of posterior margin of female sugenital plate are suggested as useful generic characters. Shape and length of male and female cerci; shape and length of apex of male subgenital plate, length and shape of egg-guide of female subgenital plate, shape of ovipositor valves and their apical tips, presence or absence of spines, tubercle on posterior ventral basivalvular sclerites of ovipositor; shape of ancorae and lophi of epiphallus; shape of apical and basal valve of aedeagus; presence or absence of protuberance on pre-apical diverticulum are considered as characters of specific significance. These characters along with already recognized coventional characters have made the identification of subfamilies, genera and species more stable and practicable.

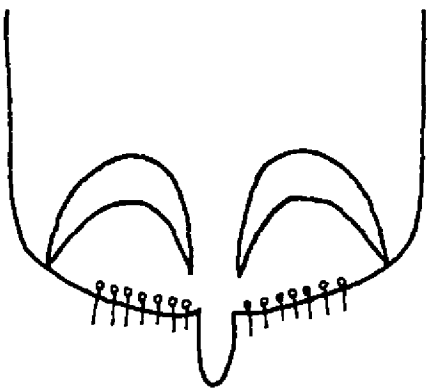
12. Brief diagnosis and keys to subfamilies, genera and species found during the present study are given. In the key besides using the conventional characters proposed by earlier workers, some additional characters of male and female genitalic structures are also incorporated. All the species recorded from this region are provided with photographs, description and illustrations of genitalic structures. Distribution and host plant data are given for all the species.

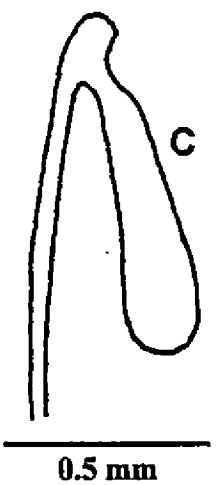
13. Generic and specific synonymies are quoted. Authors who synonymised the genera and species cited in brackets after authors of respective taxa. The terminology of the morphological characters used in the present work is the same as in Dirsh's The African genera of Acridoidea, Cambridge, 1965.

14. Holotype, paratypes and other material collected during the survey is deposited in museum collection of the Department of Zoology, Aligarh Muslim University, Aligarh.

Plates







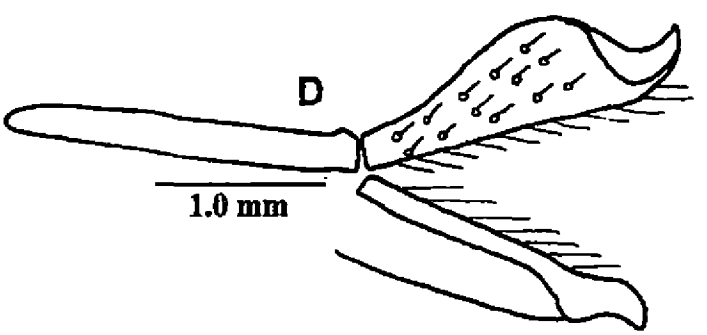
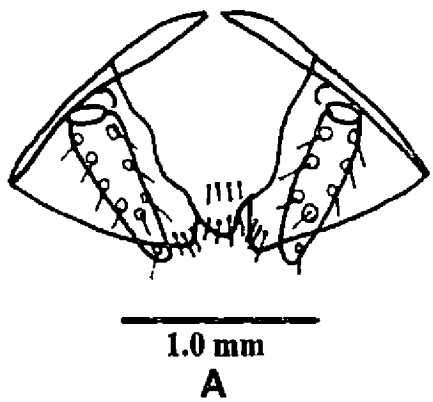
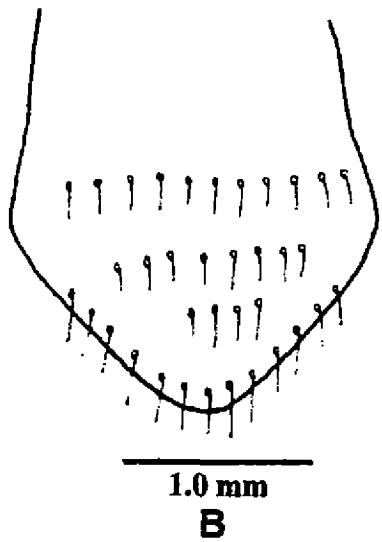
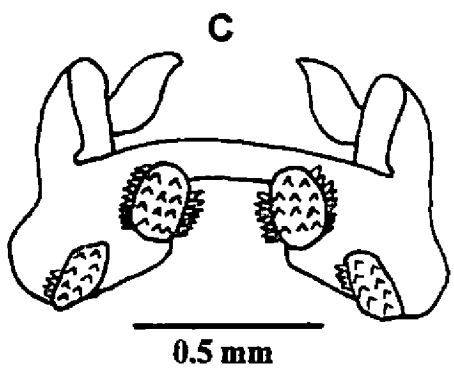


Plate 4: *Brachycrotaphus longiceps* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor







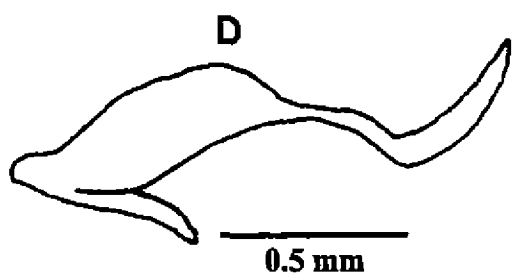


Plate 5: *Leva indica* (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus

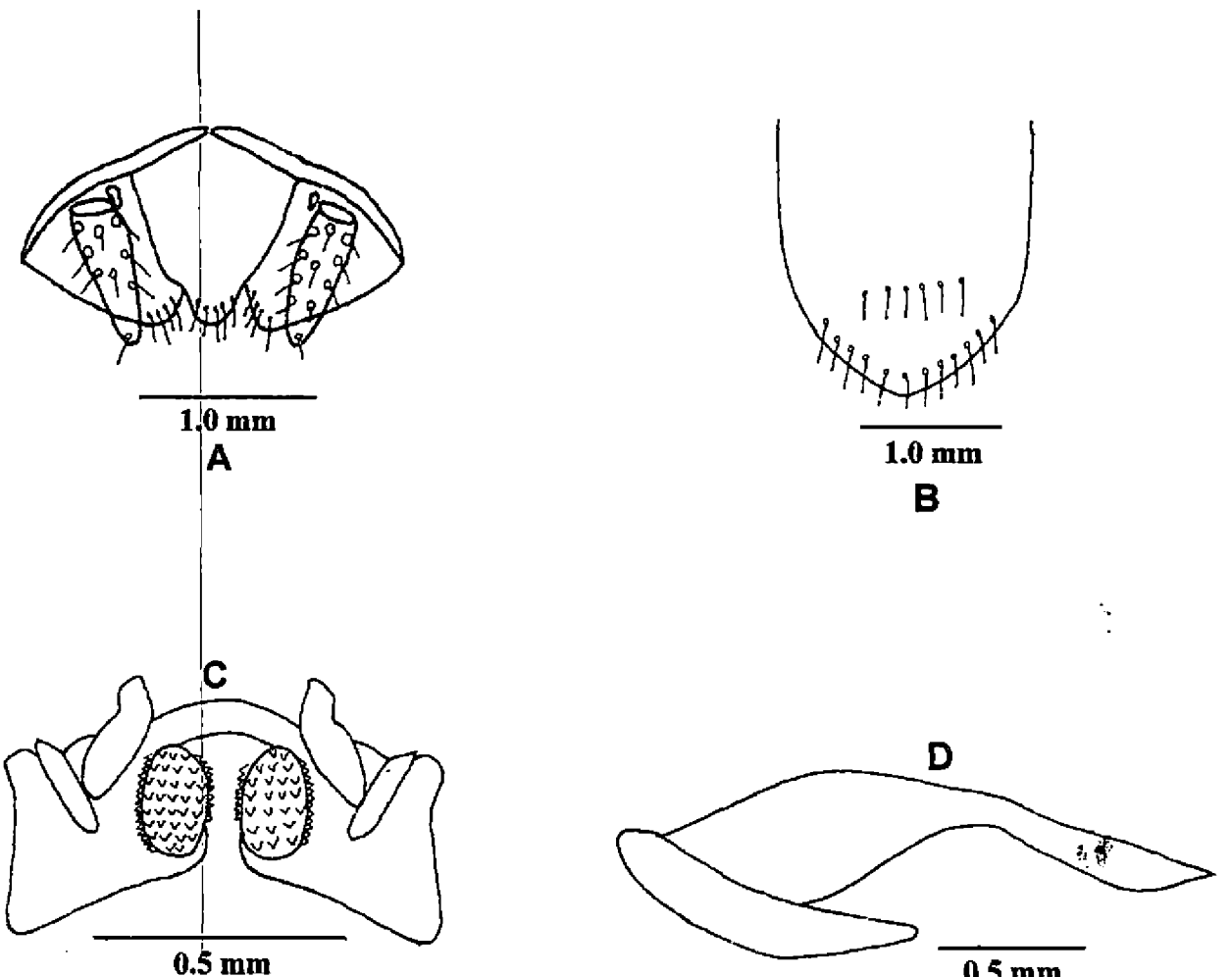
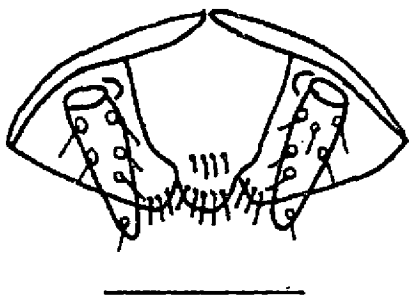


Plate 6: *Dociostauras (D.) apicalis* (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus



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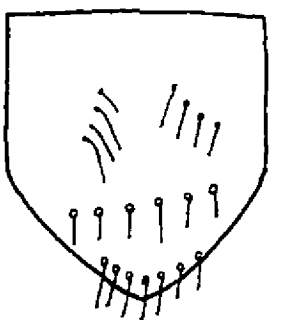

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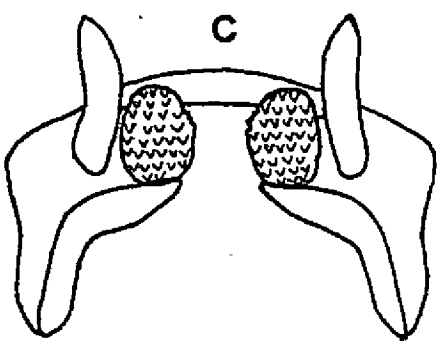

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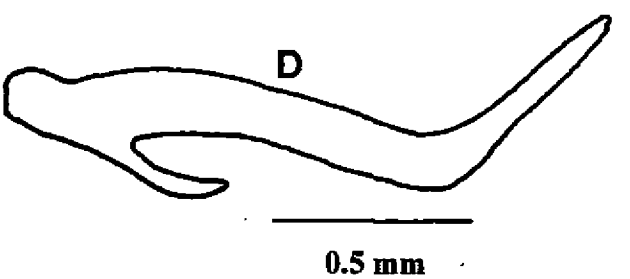

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Plate 7: *Chorthippus indus* (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus

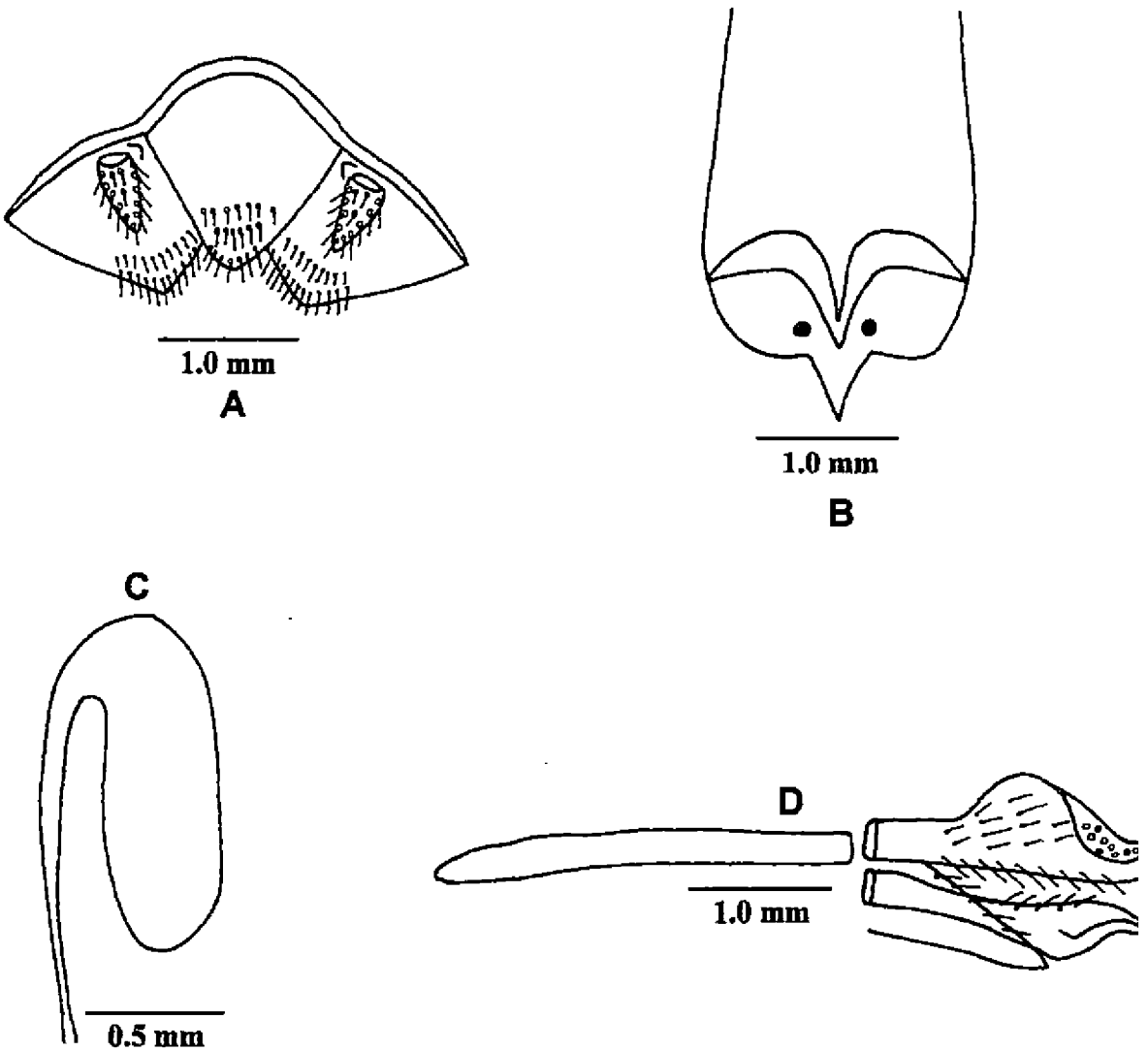
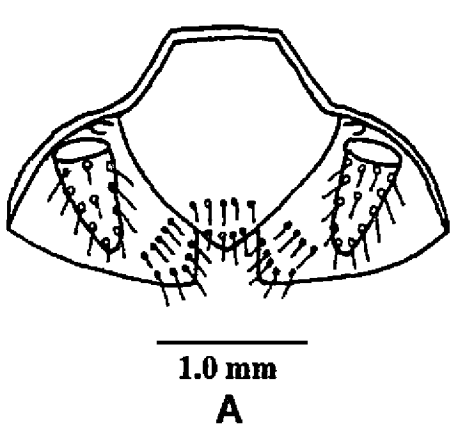
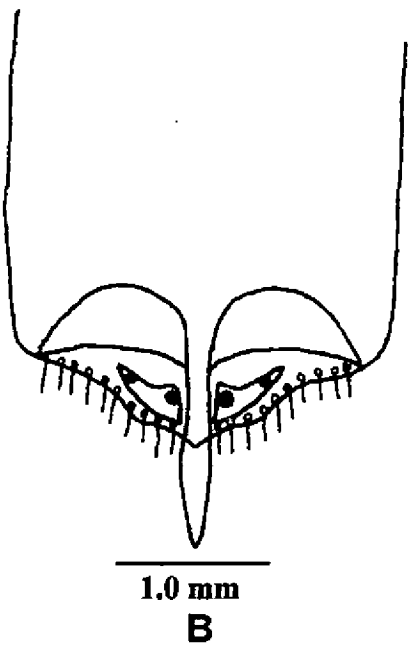


Plate 8: *Aulacobothrus taeniatus* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor





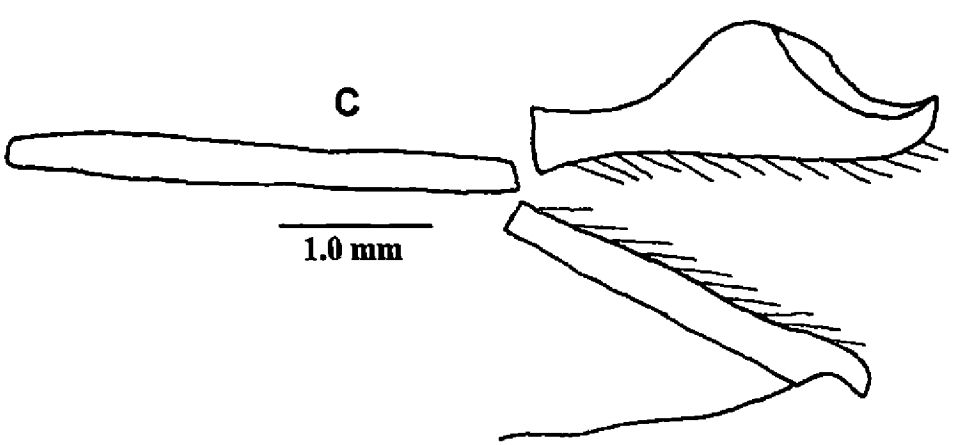


Plate 9: *Aulacobothrus l. luteips* (female) A. Supra anal plate, B. Subgenital plate, C. Ovipositor

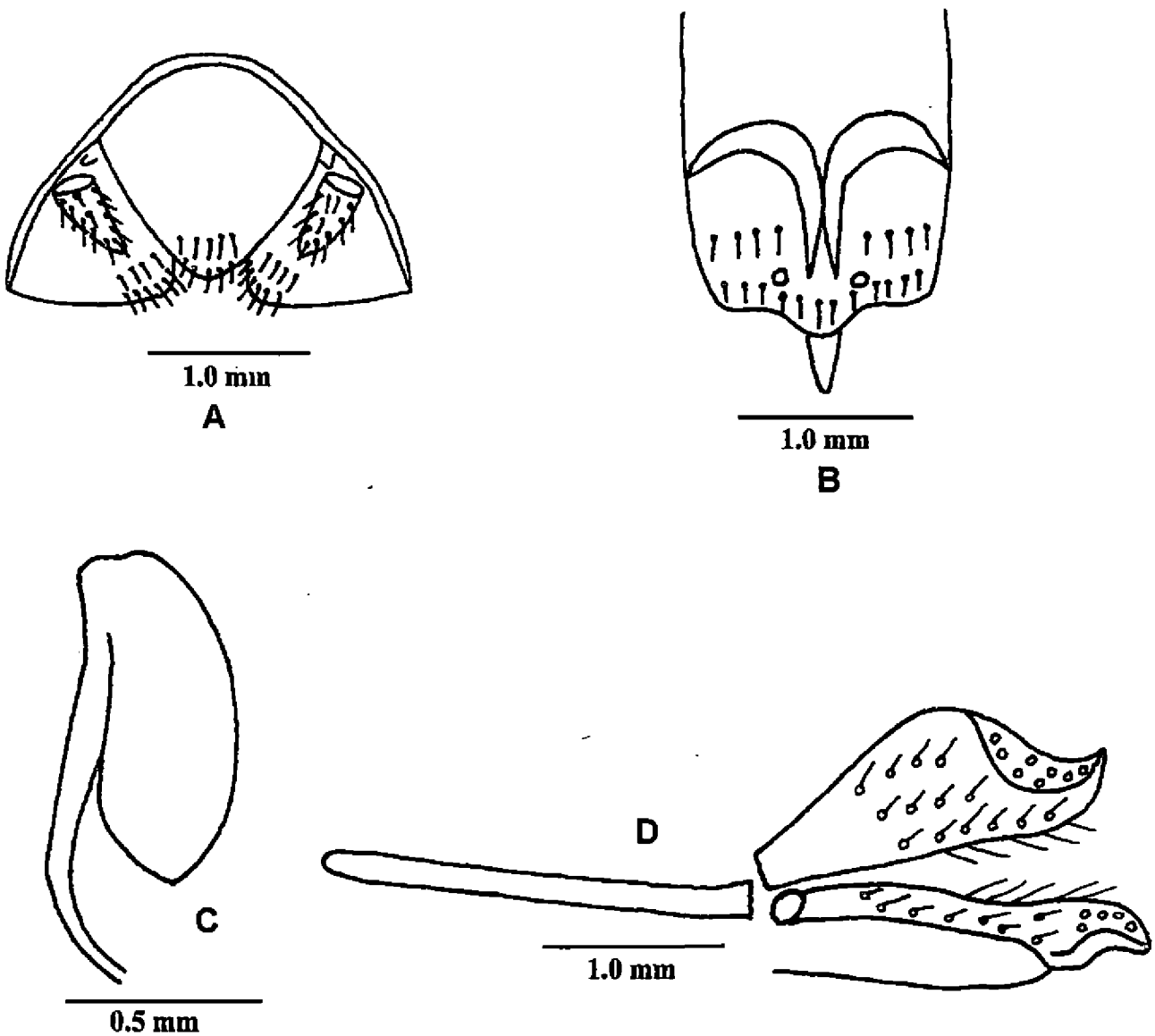


Plate 10: *Leinotacris bolivari* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

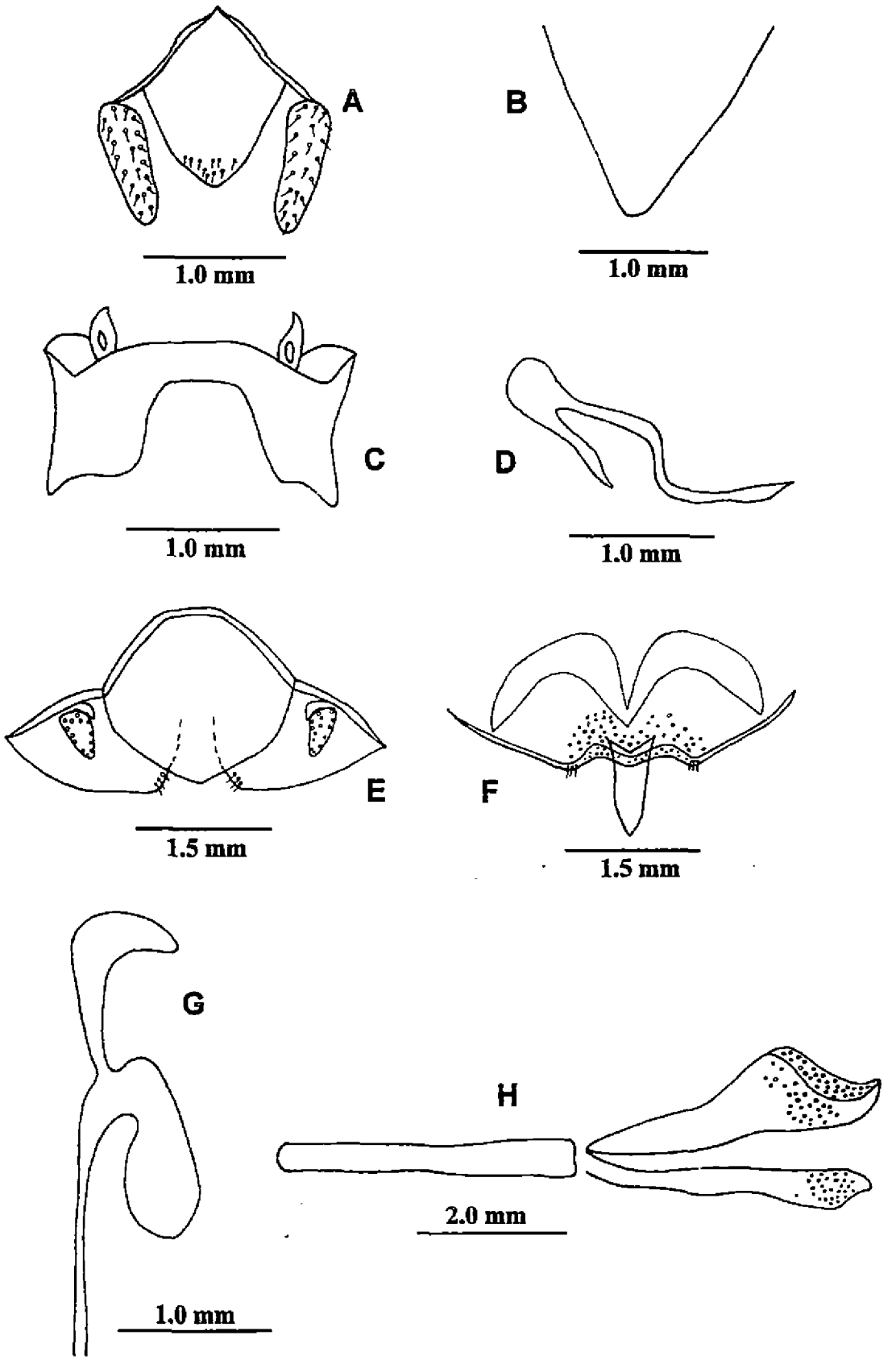


Plate 11: *Acrida exaltata* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

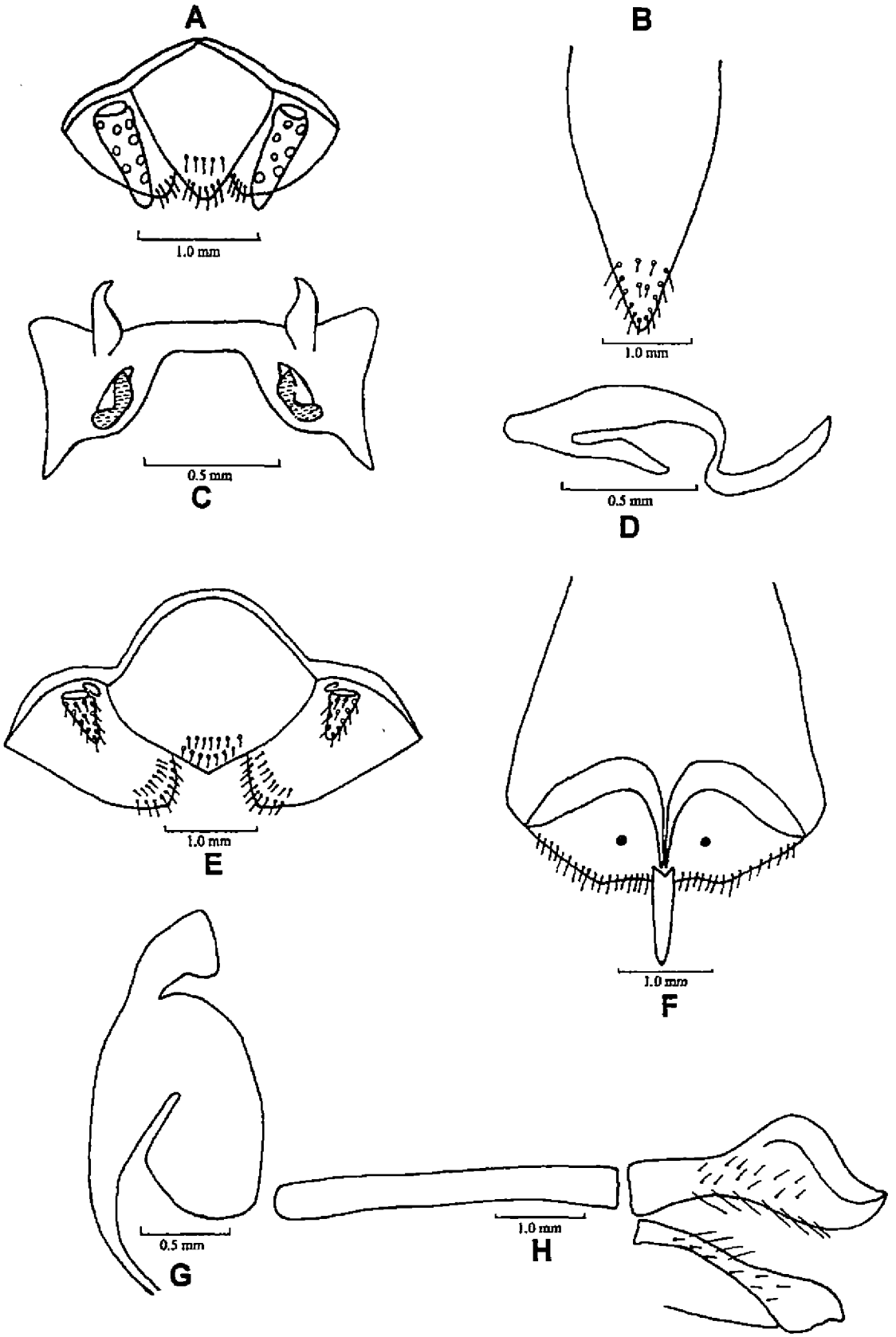


Plate 12: *Acrida gigantea* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

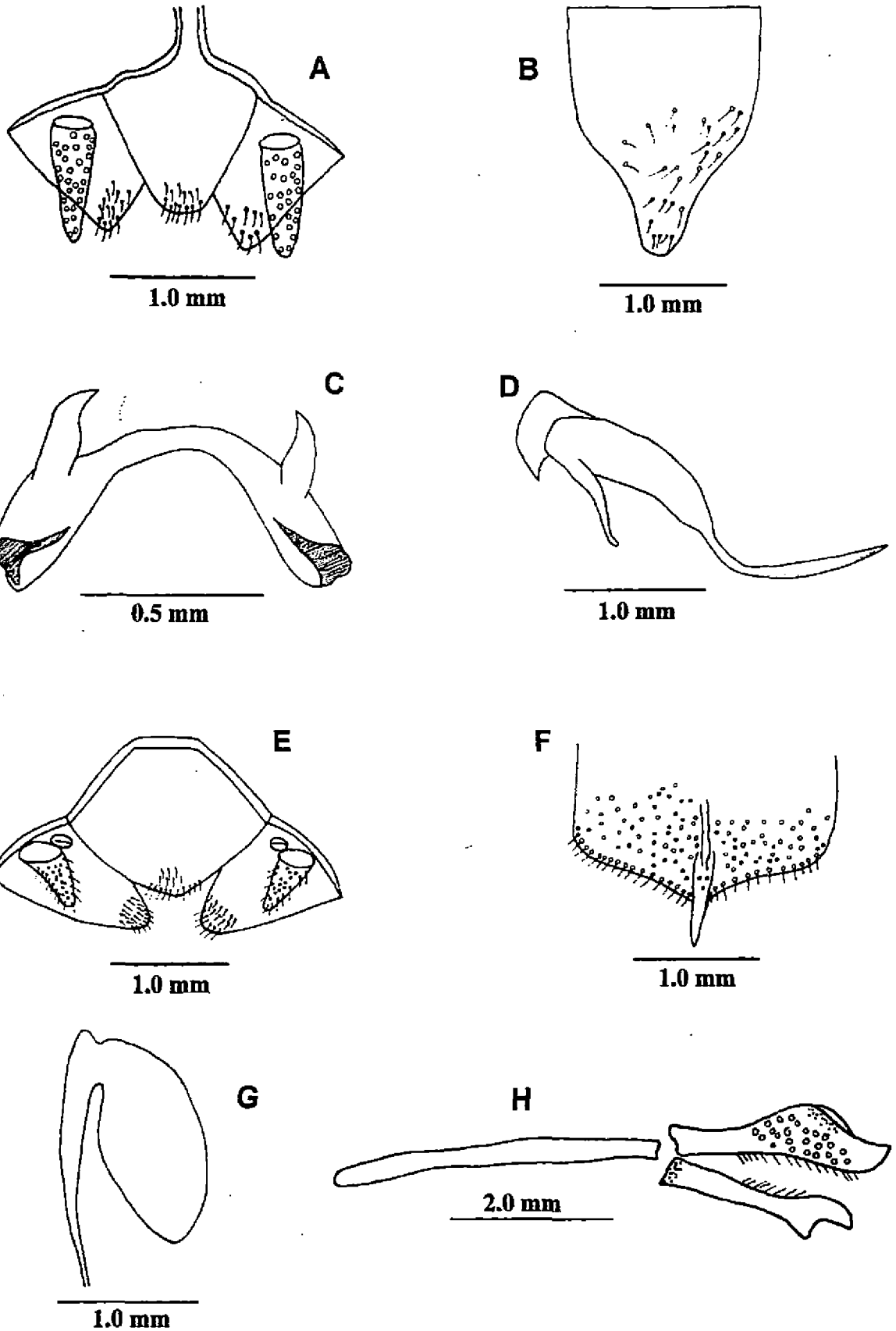


Plate 13: *Phlaeoba infumata* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

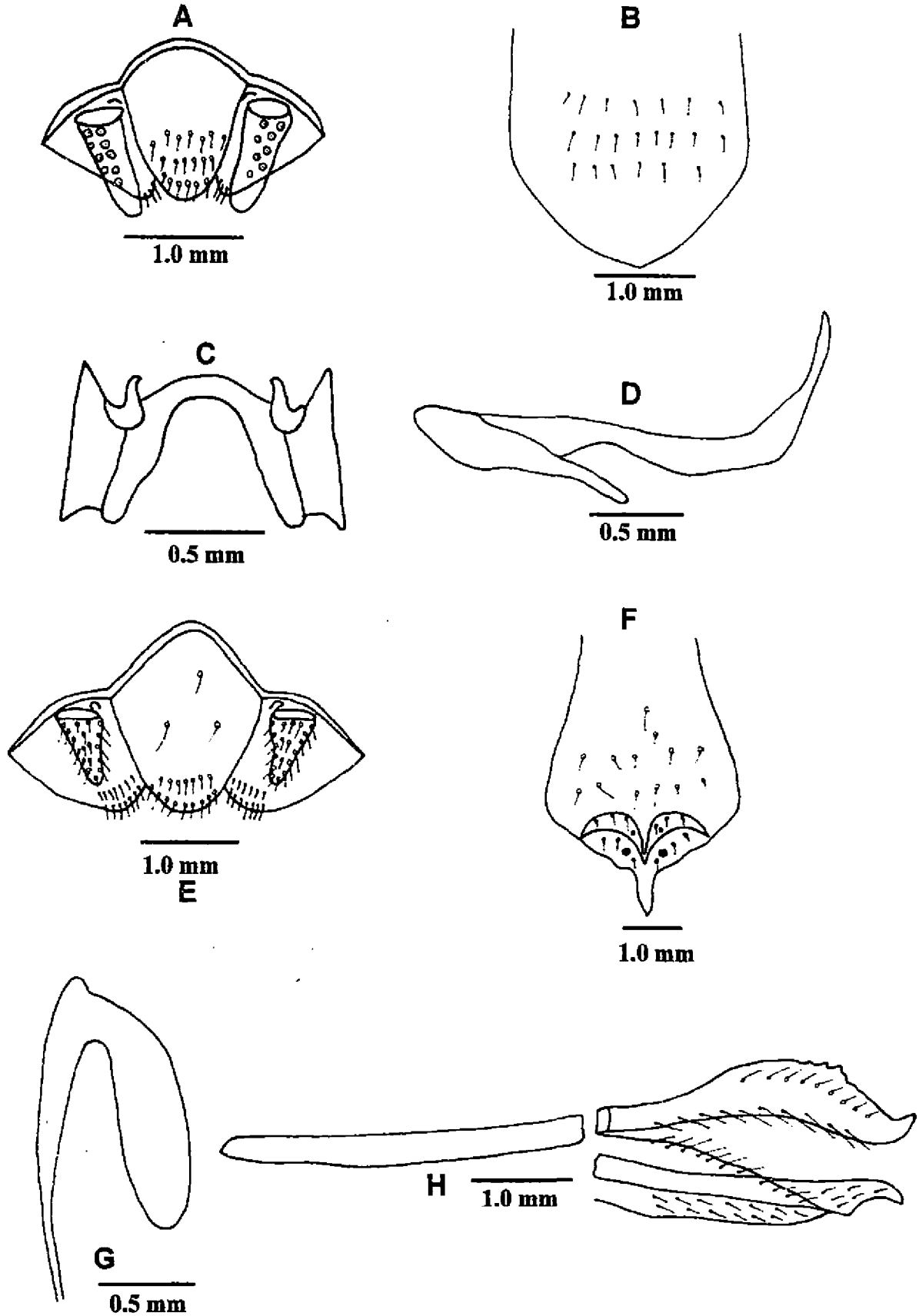
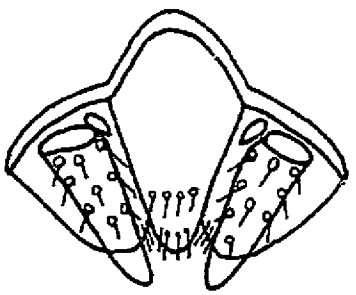


Plate 14: *Phlaeoba panteli* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor



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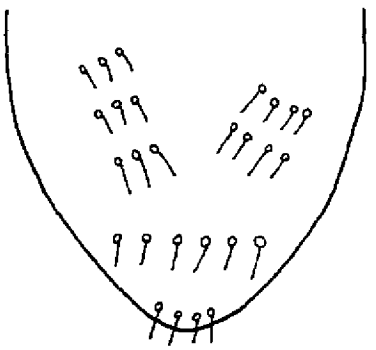

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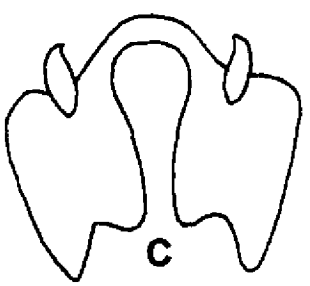

C

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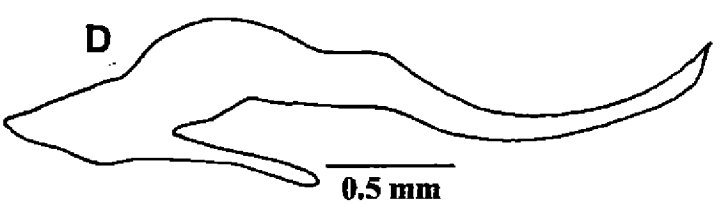


D

0.5 mm

Plate 15: *Phlaeoba angustidorsis* A-D (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus

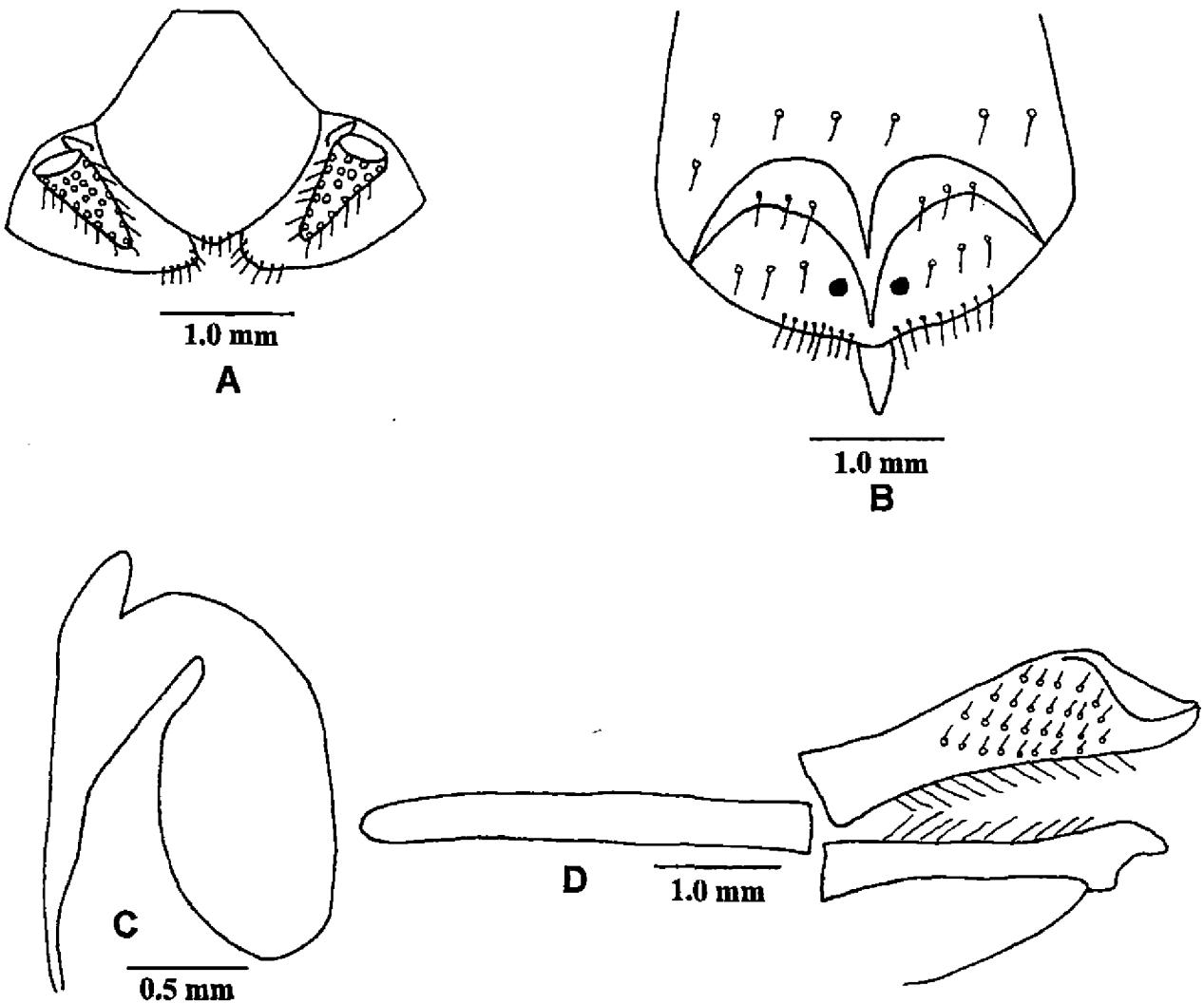


Plate 16: *Phlaeoba tenebrosa* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

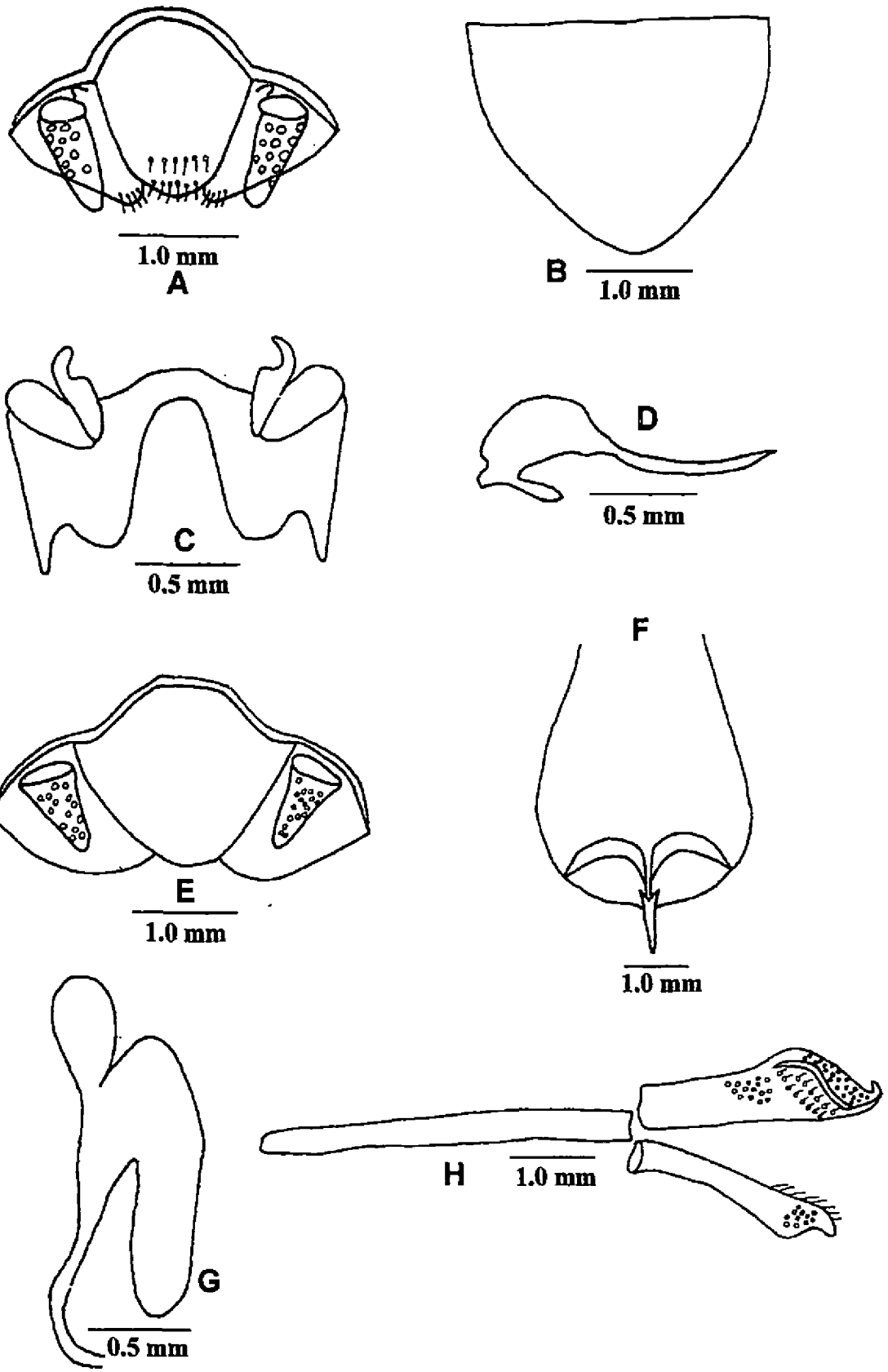


Plate 17: *Orthoctha indica* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

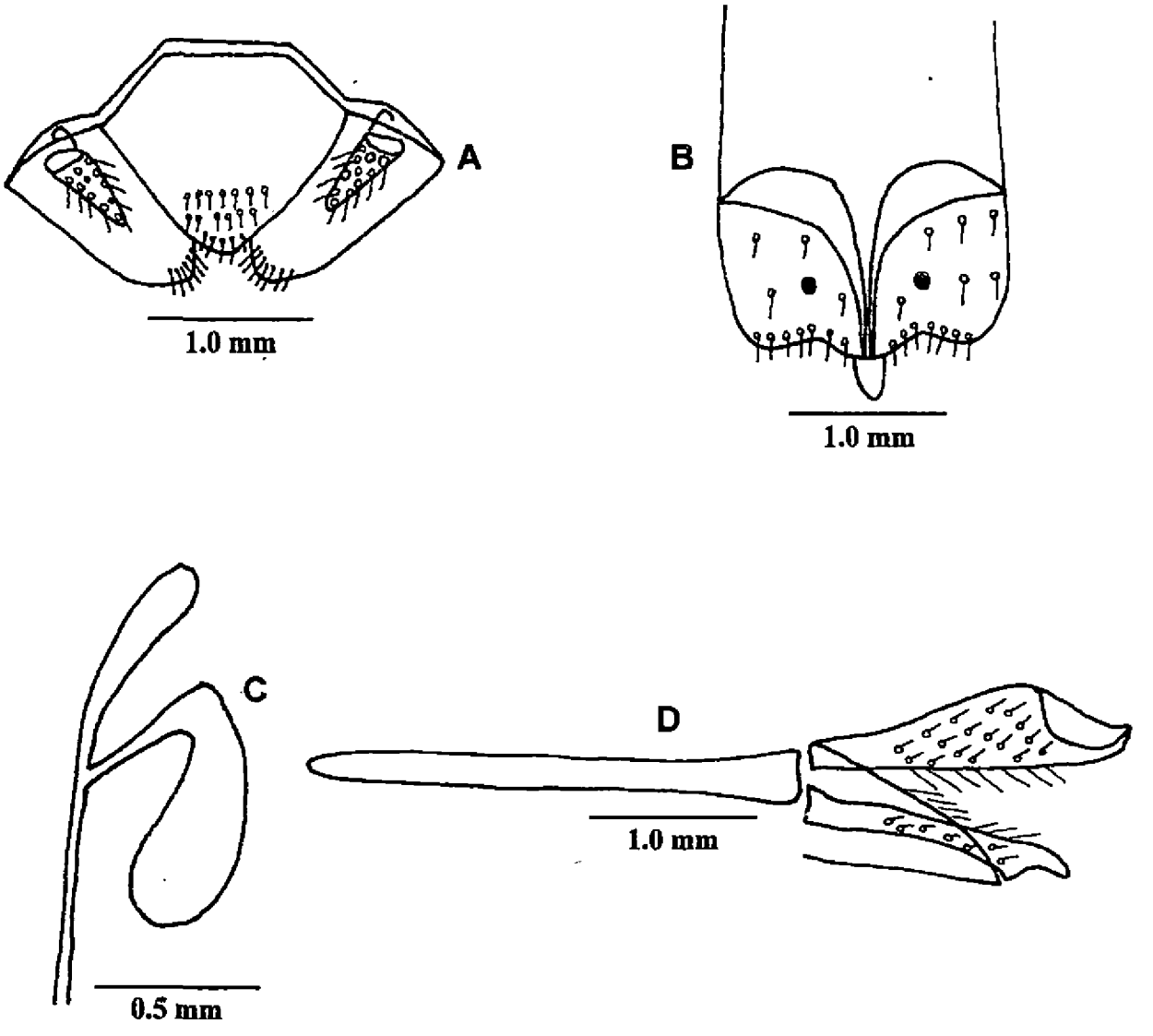


Plate 18: *Sphingonotus c. caerulans* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

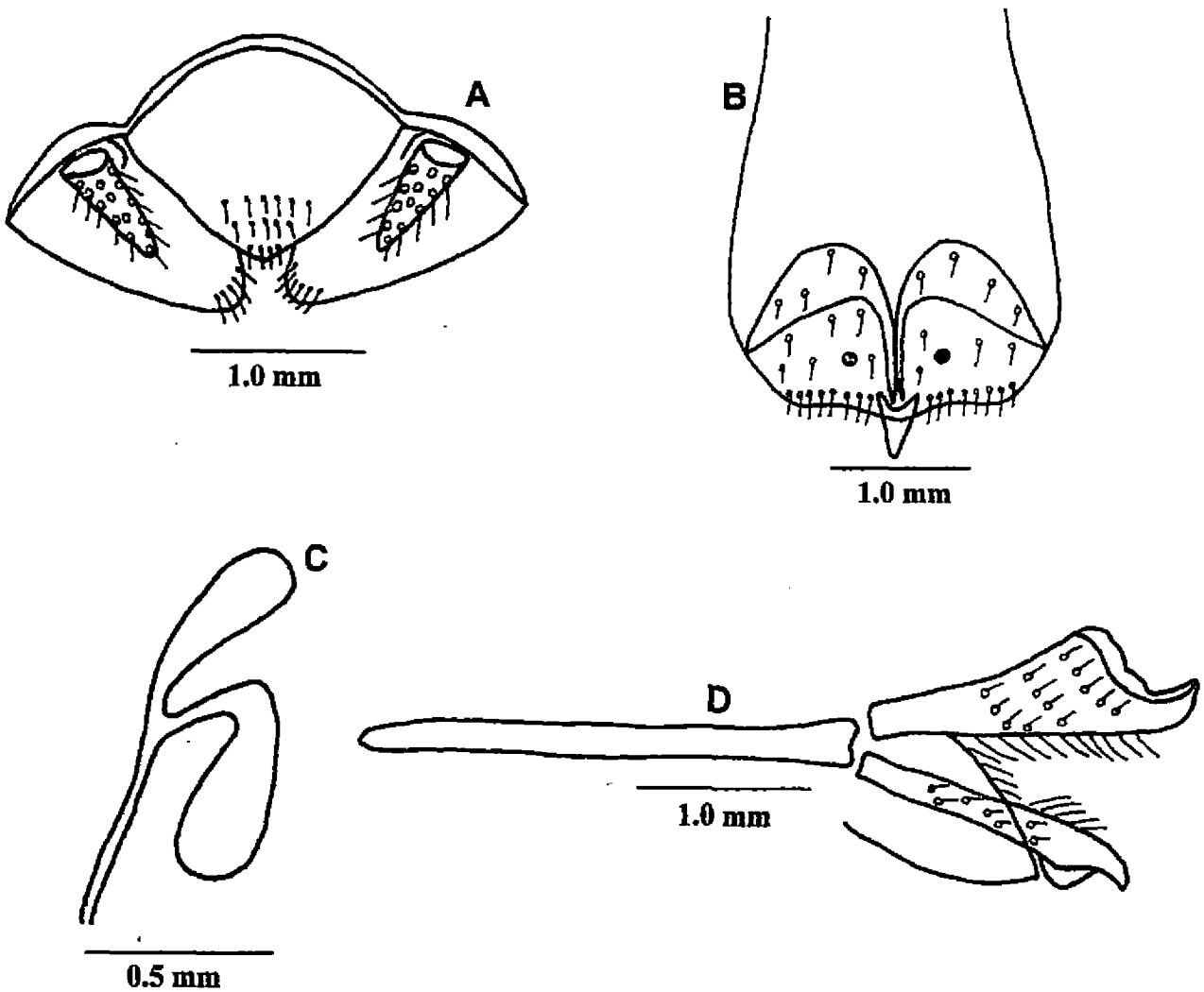


Plate 19: *Sphingonotus r. rubescens* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

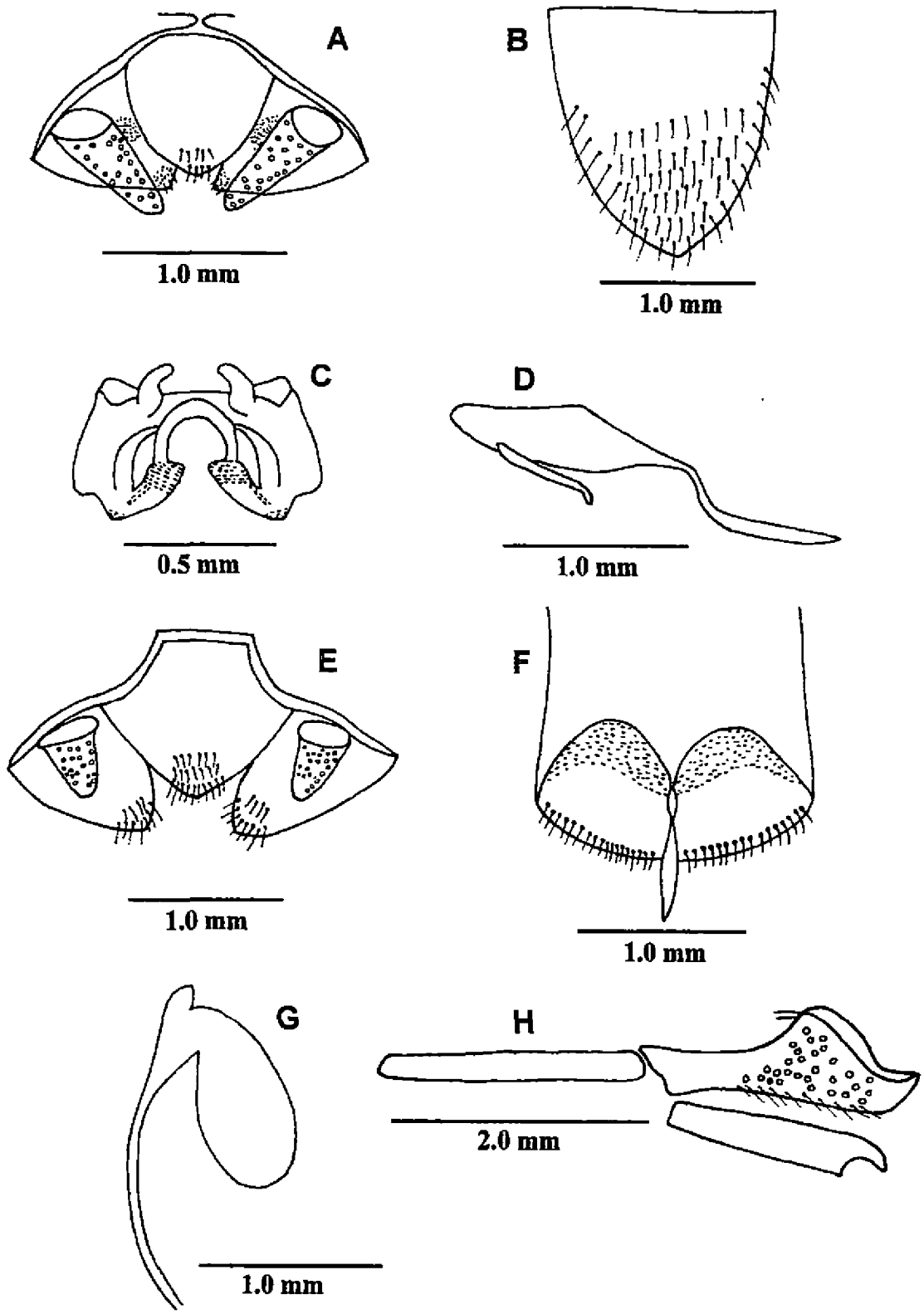


Plate 20: *Trilophidia annulata* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

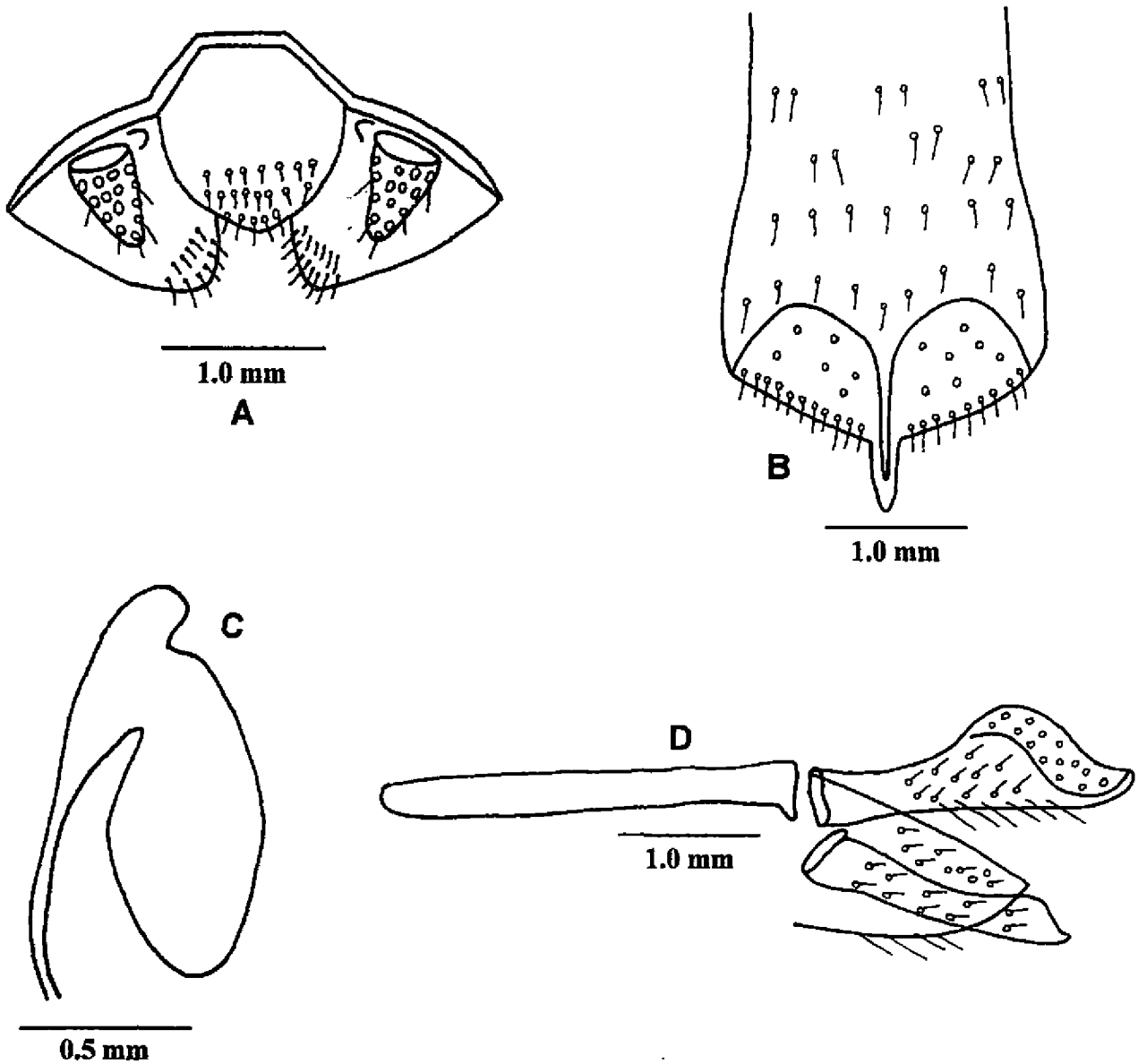


Plate 21: *Trilophidia repleta* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

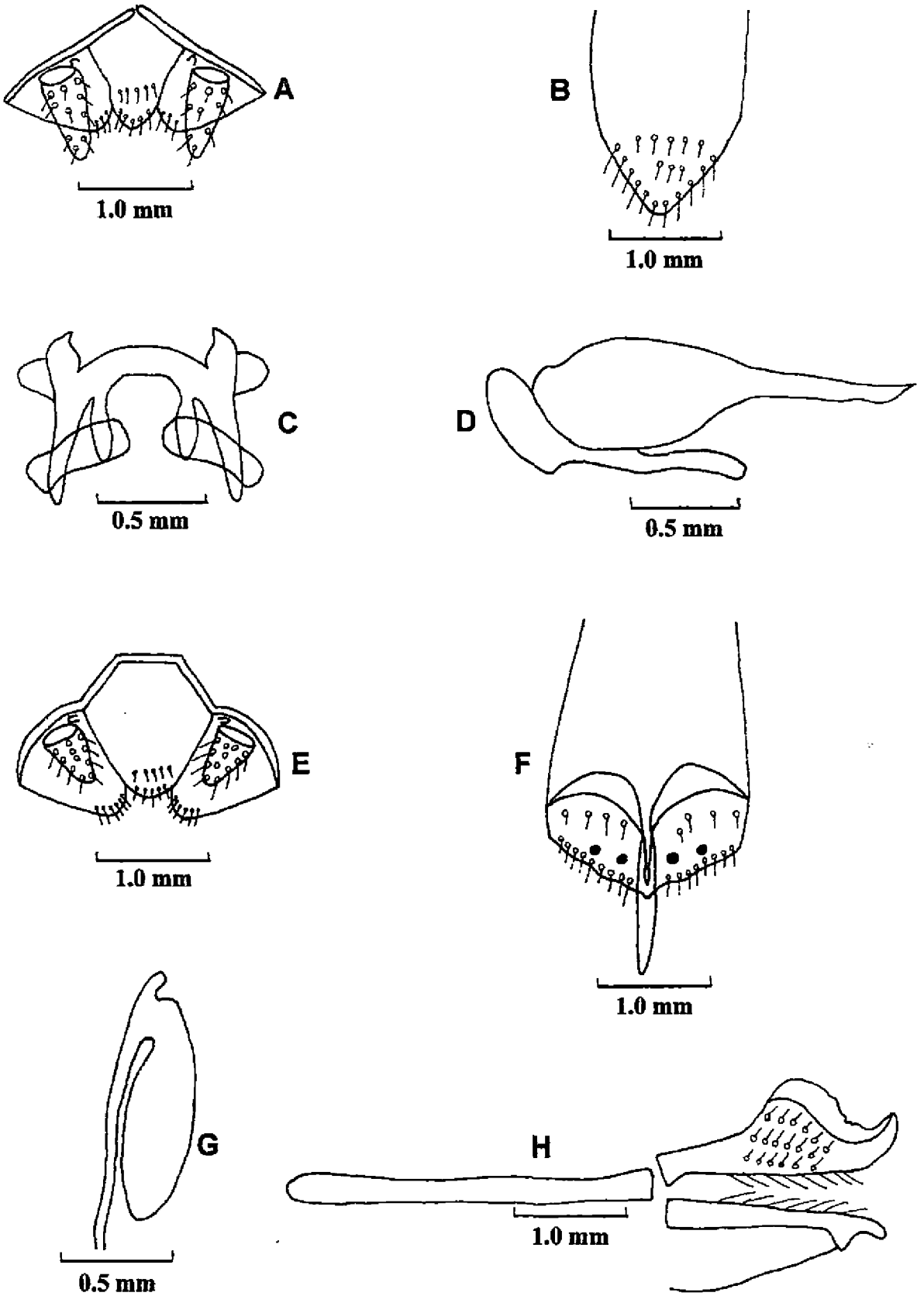


Plate 22: *Aiolopus t. thalassinus* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

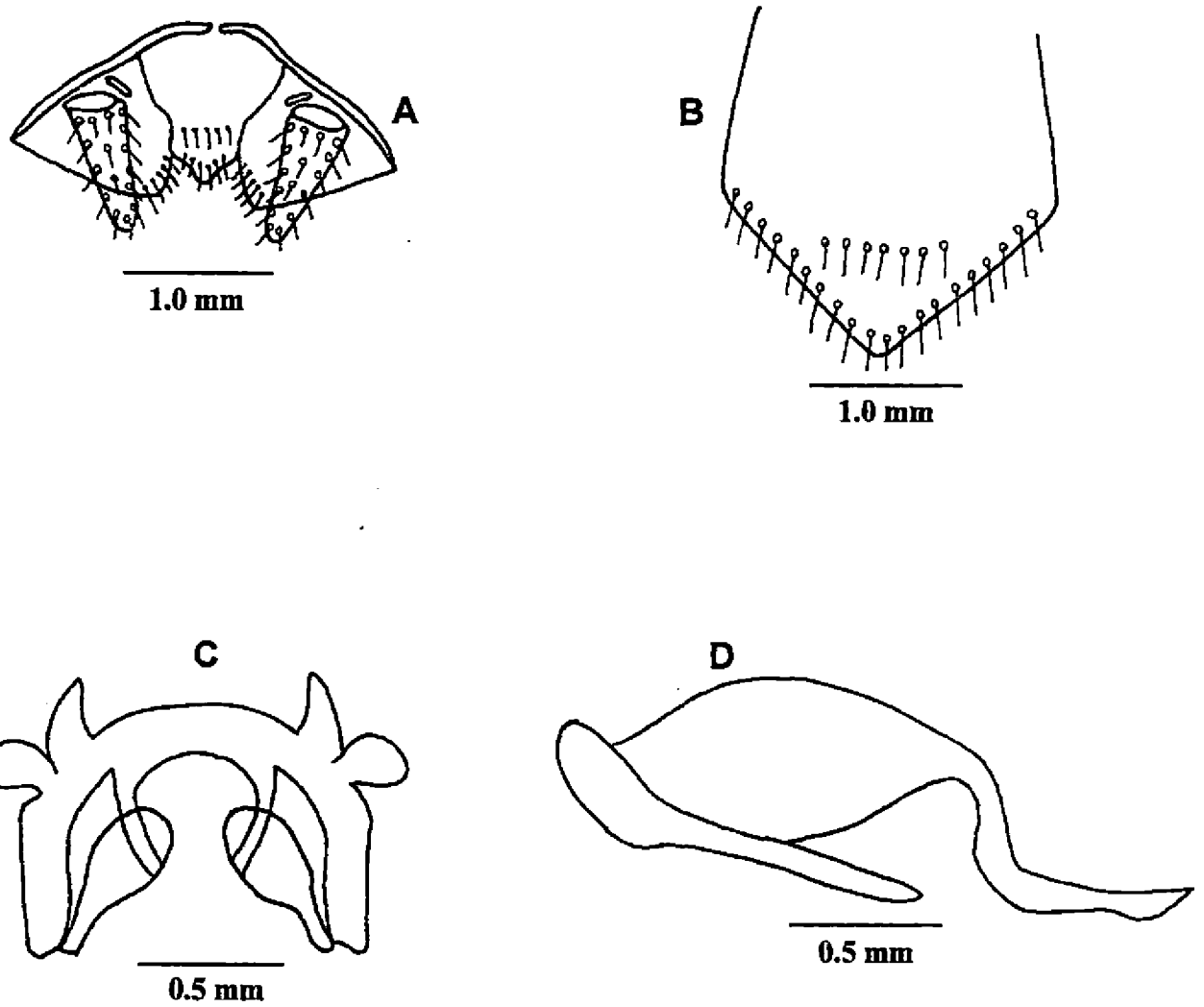


Plate 23: *Aiolopus t. tamulus* (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus

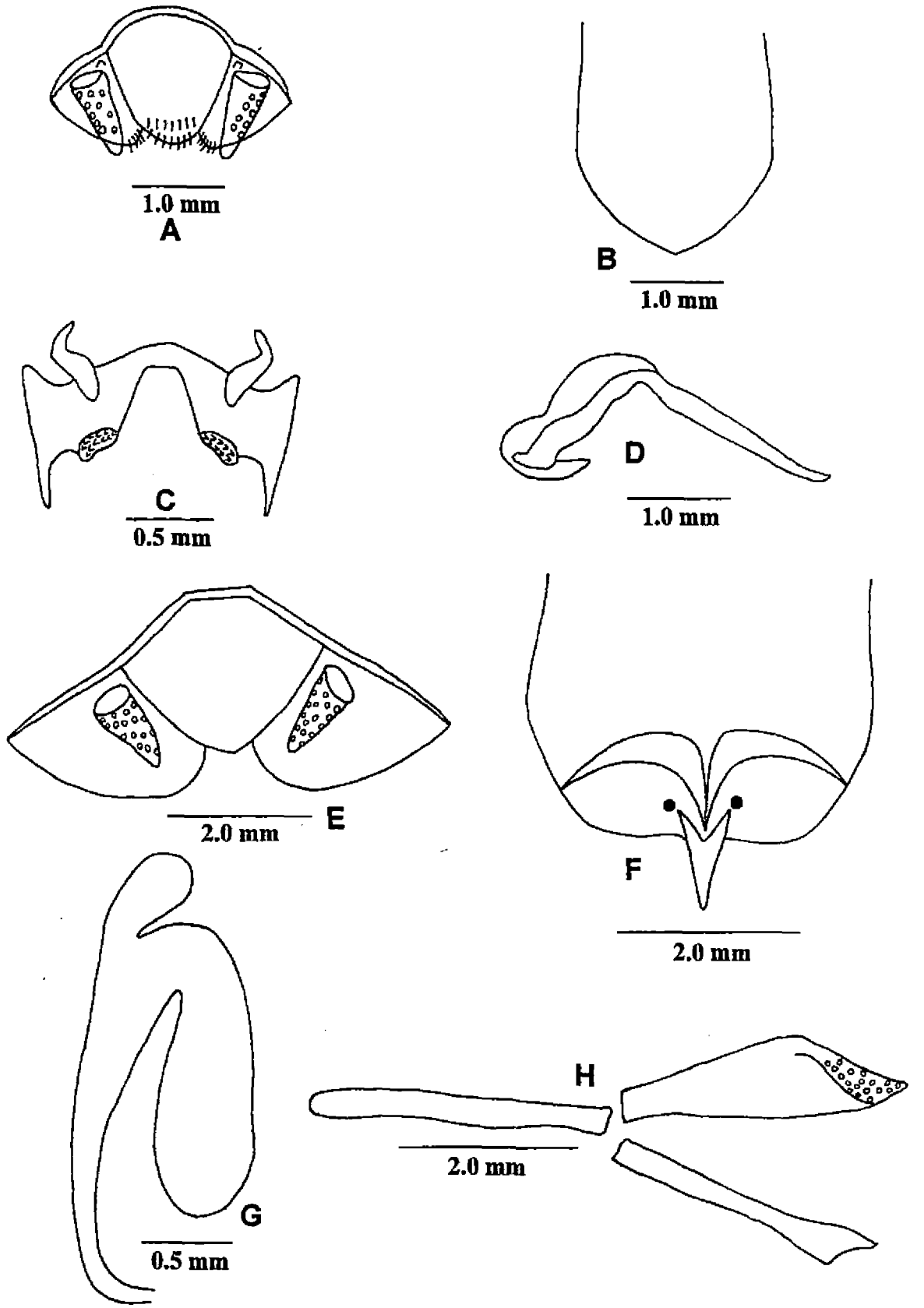


Plate 24: *Ceracris deflorata* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

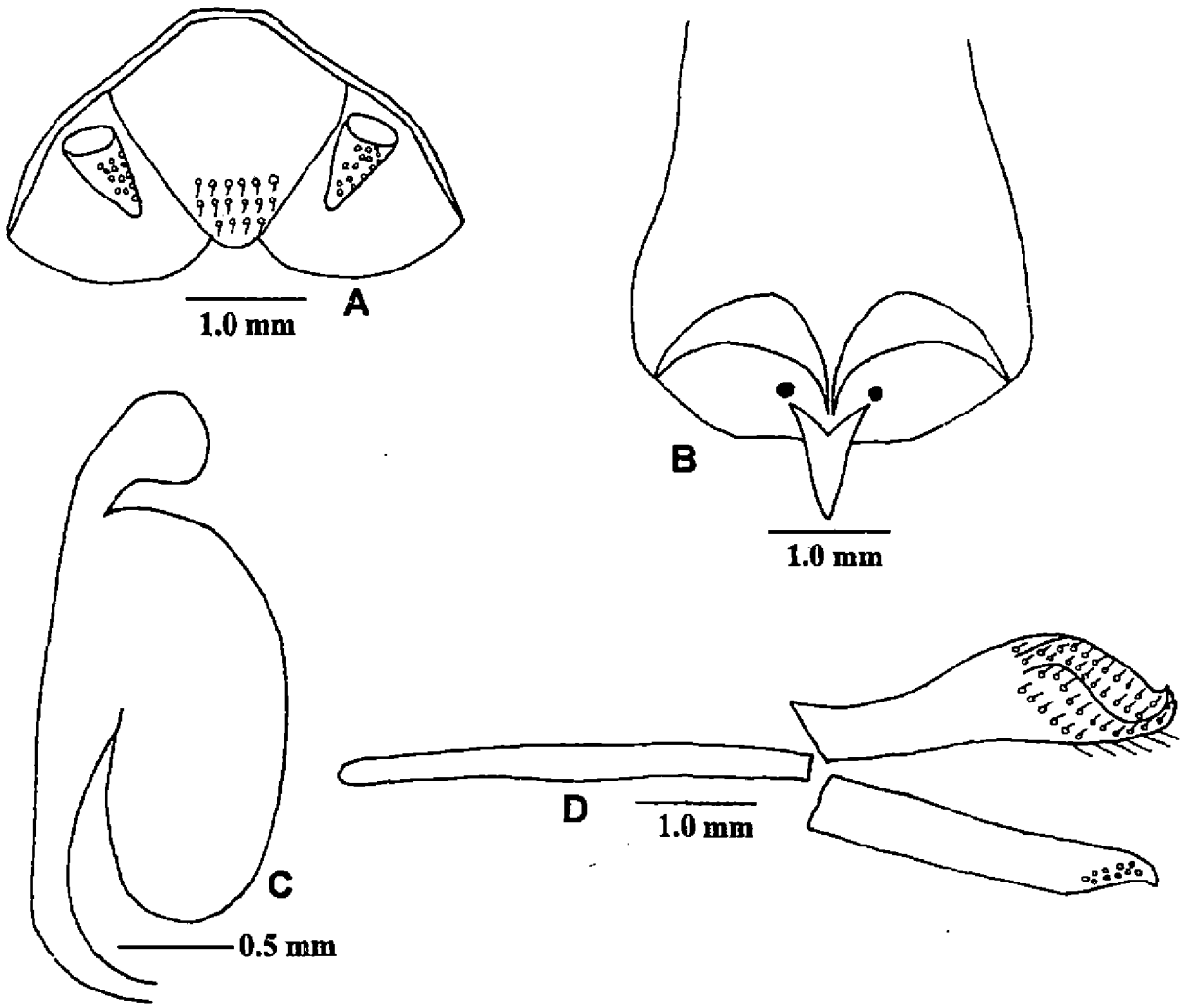


Plate 25: *Ceracris nigricornis* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

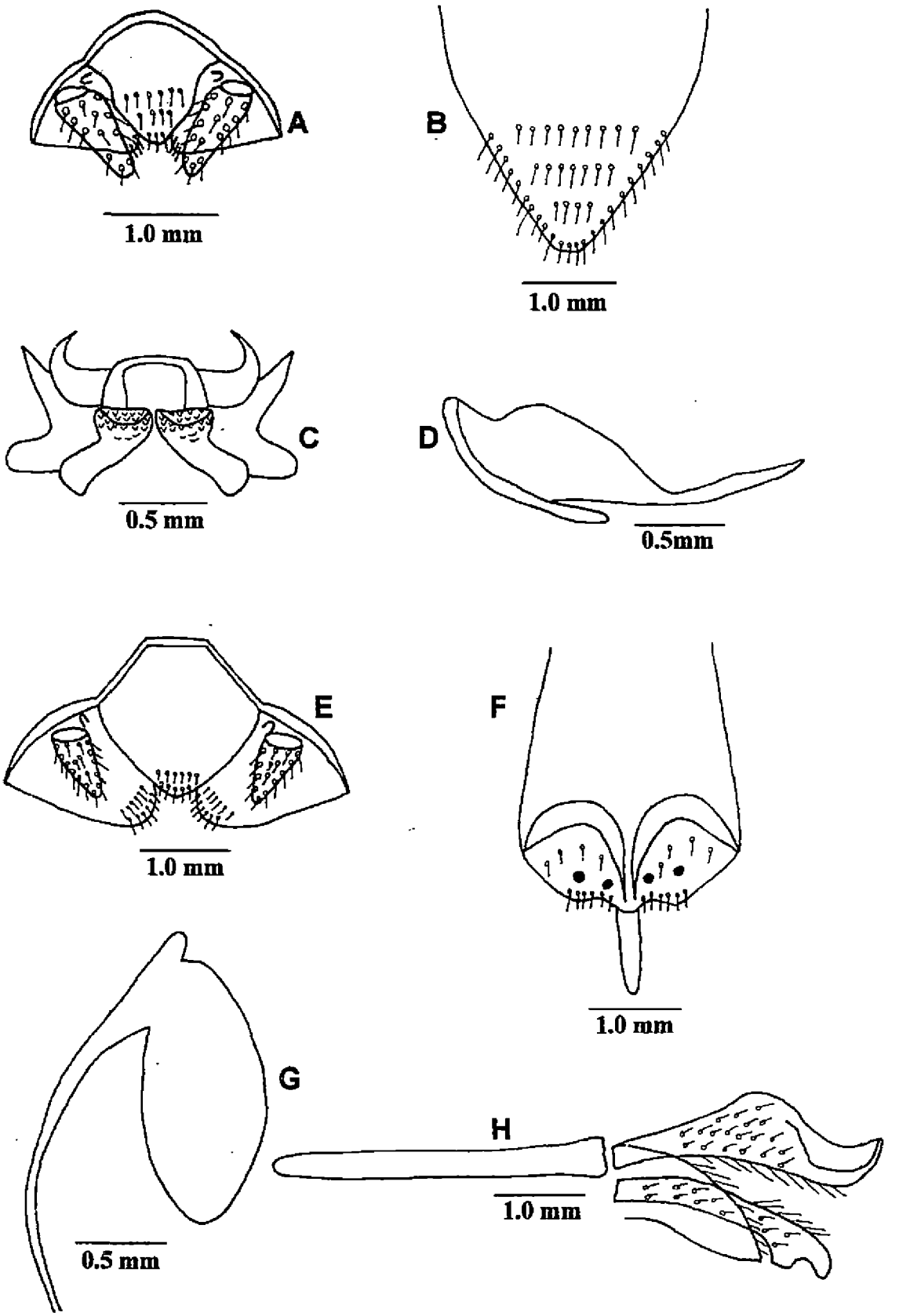


Plate 26: *Heteropternis respondens* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca; H. Ovipositor

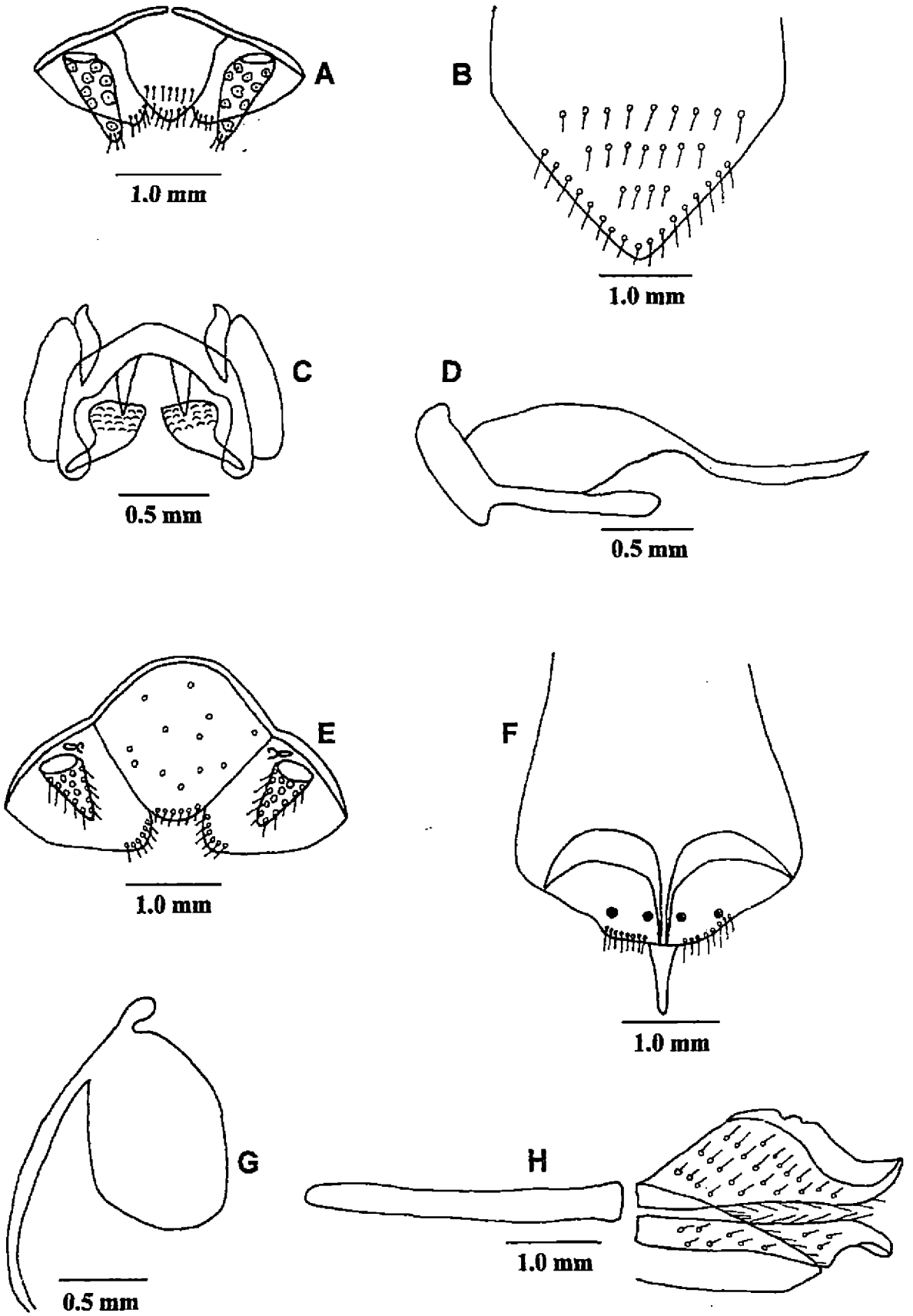


Plate 27: *Dittopternis venusta* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

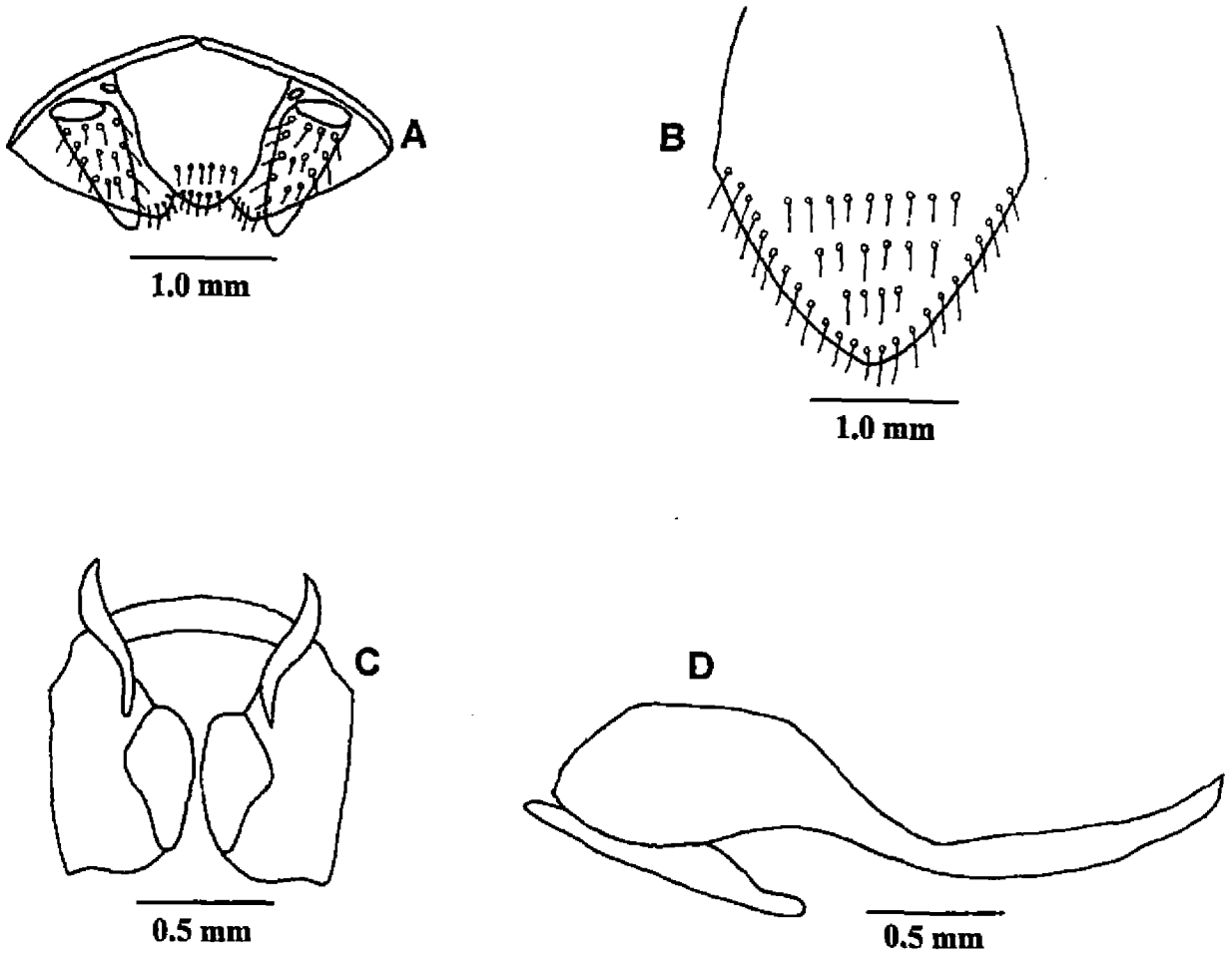


Plate 28: *Chloebora marschalli* (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus

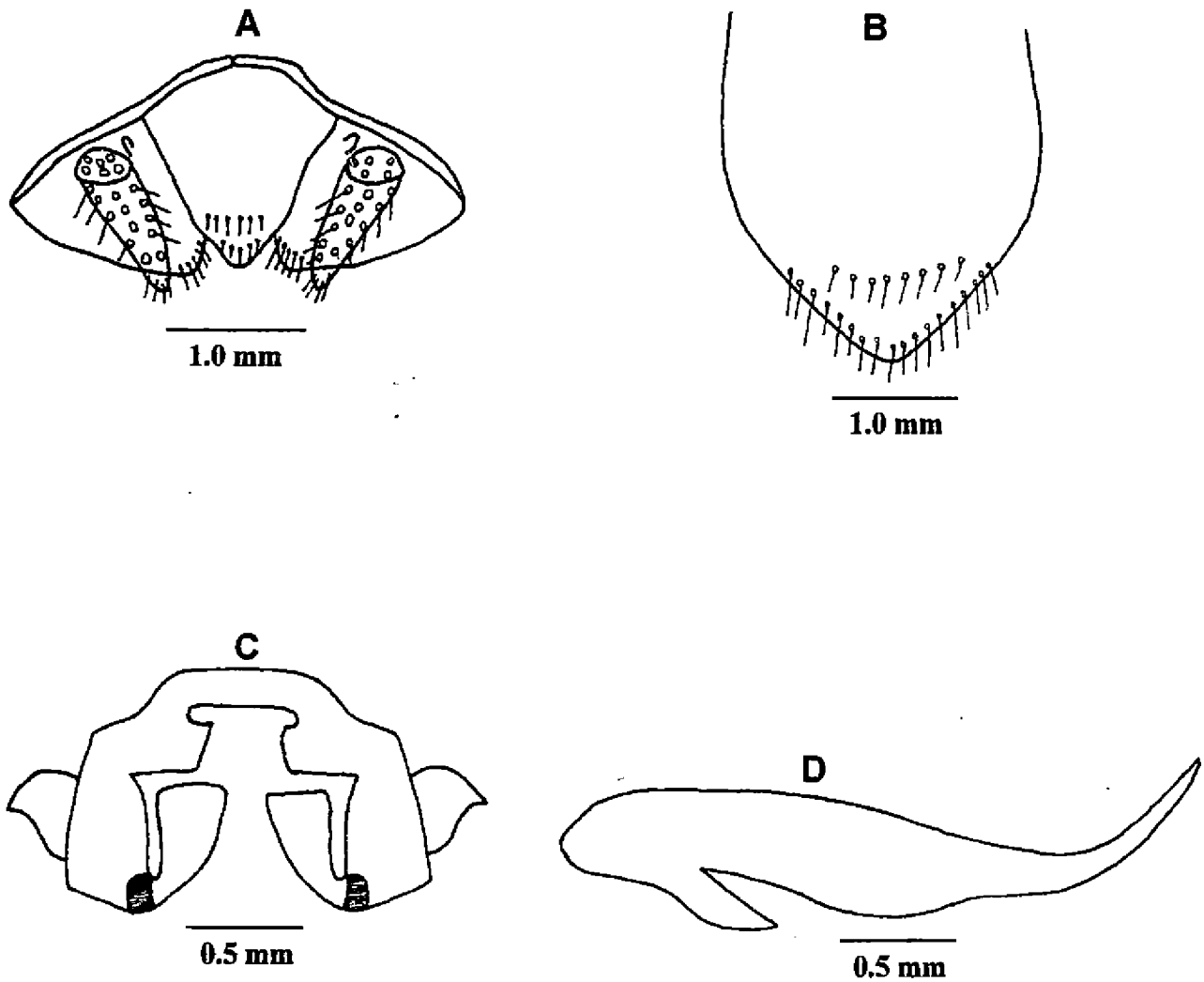


Plate 29: *Scintharista notabilis* (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus

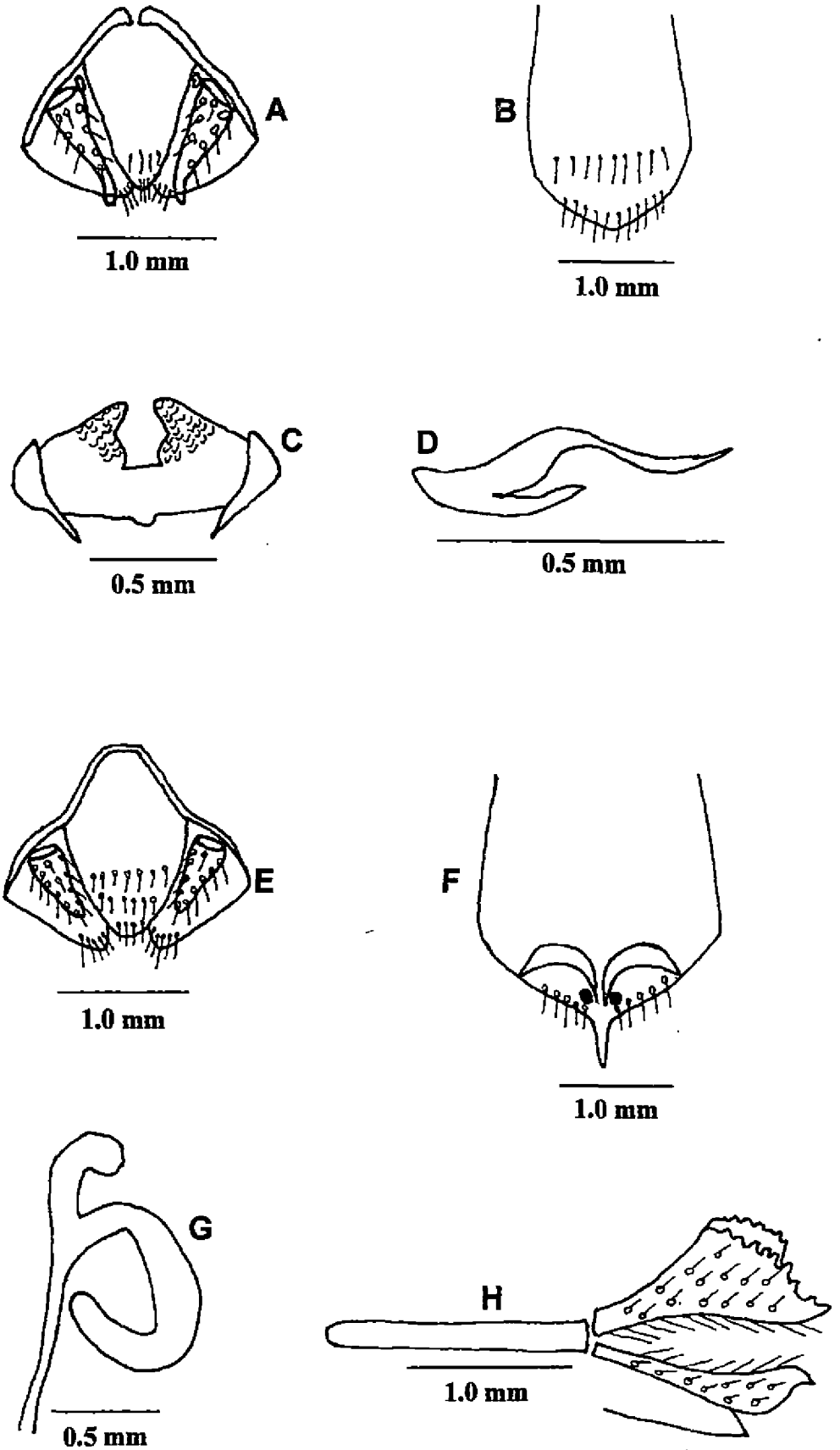


Plate 30: *Gesonula punctifrons* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

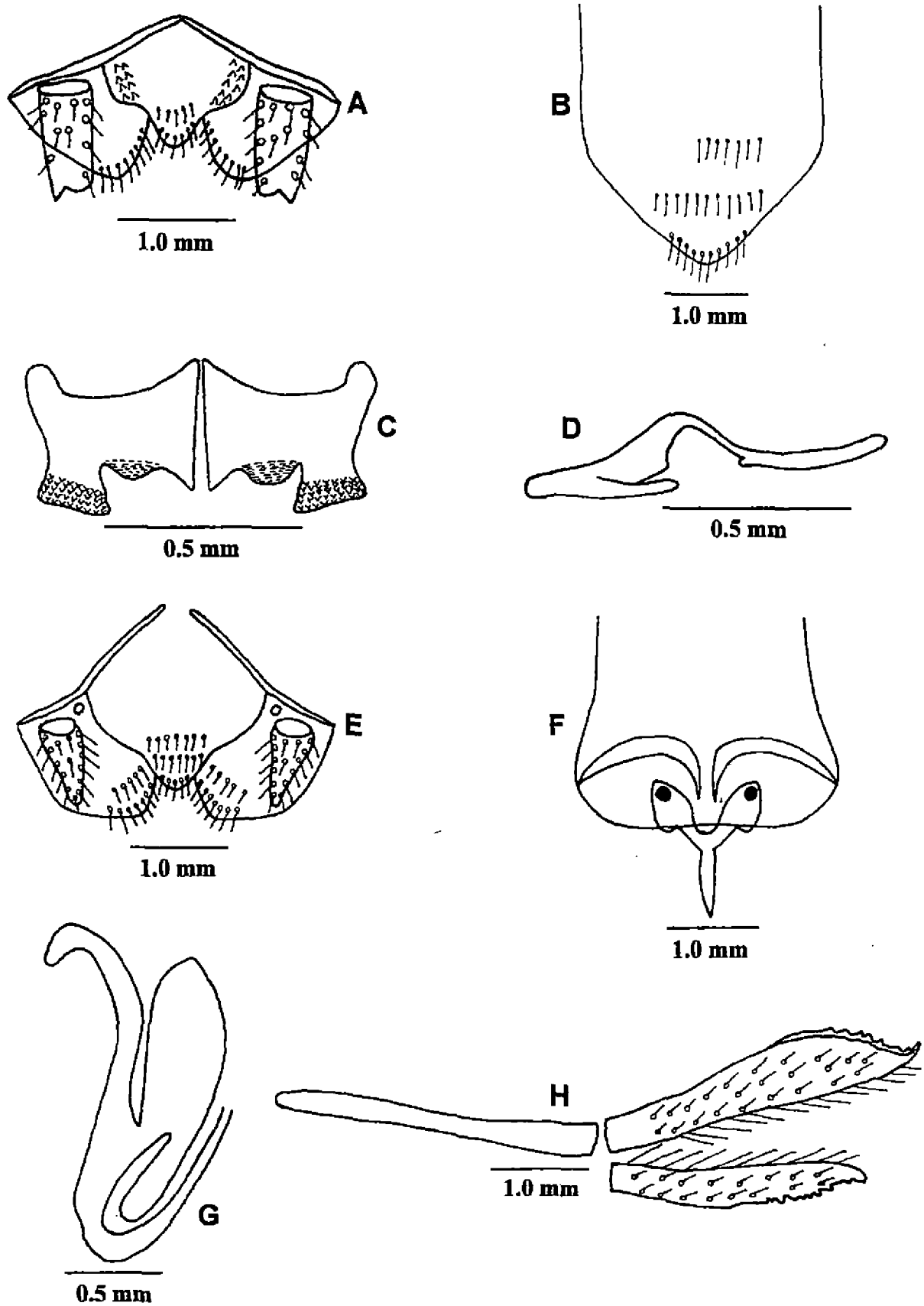


Plate 31: *Oxya fuscovittata* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

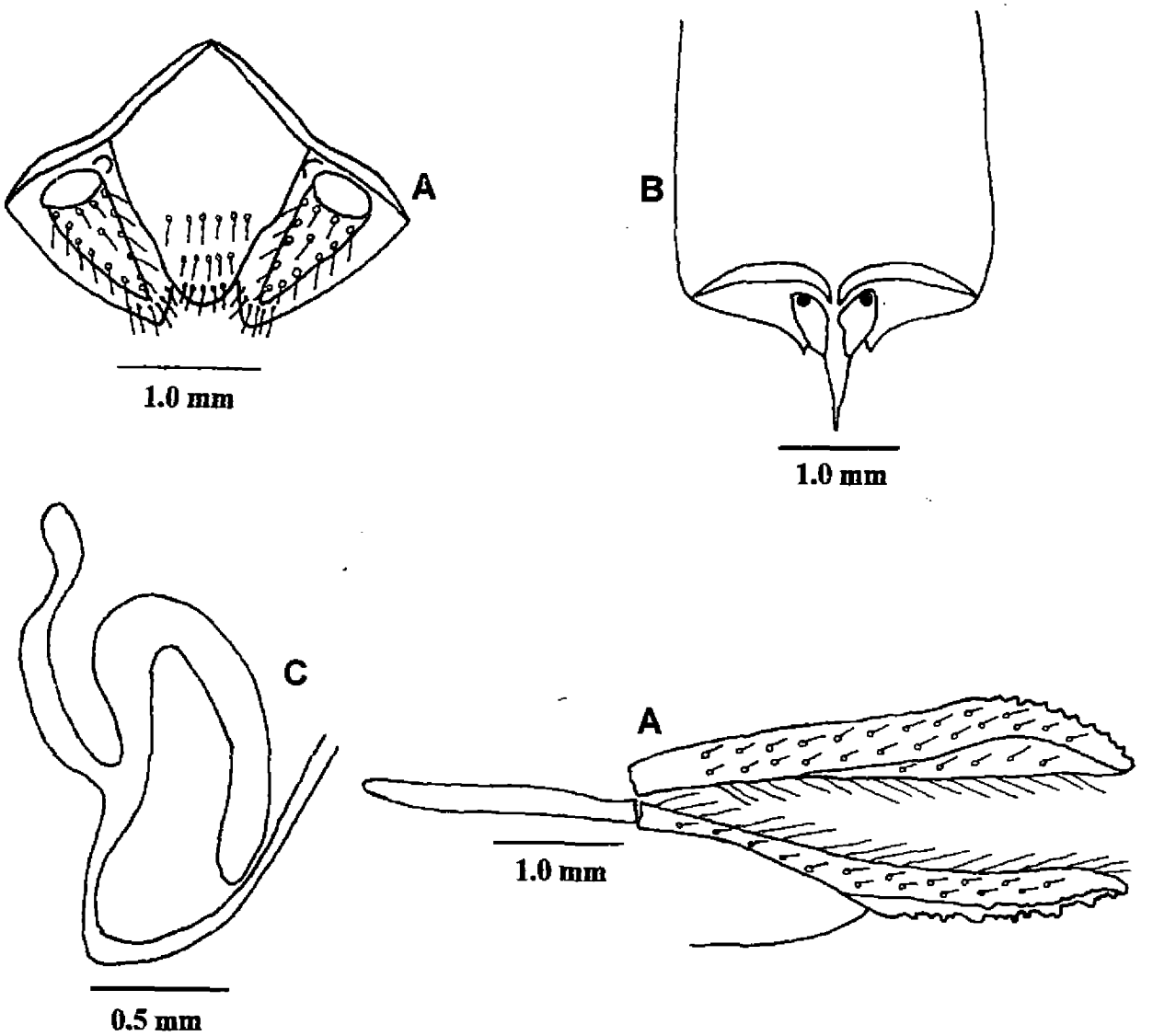


Plate 32: *Oxya japonica vitticolis* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

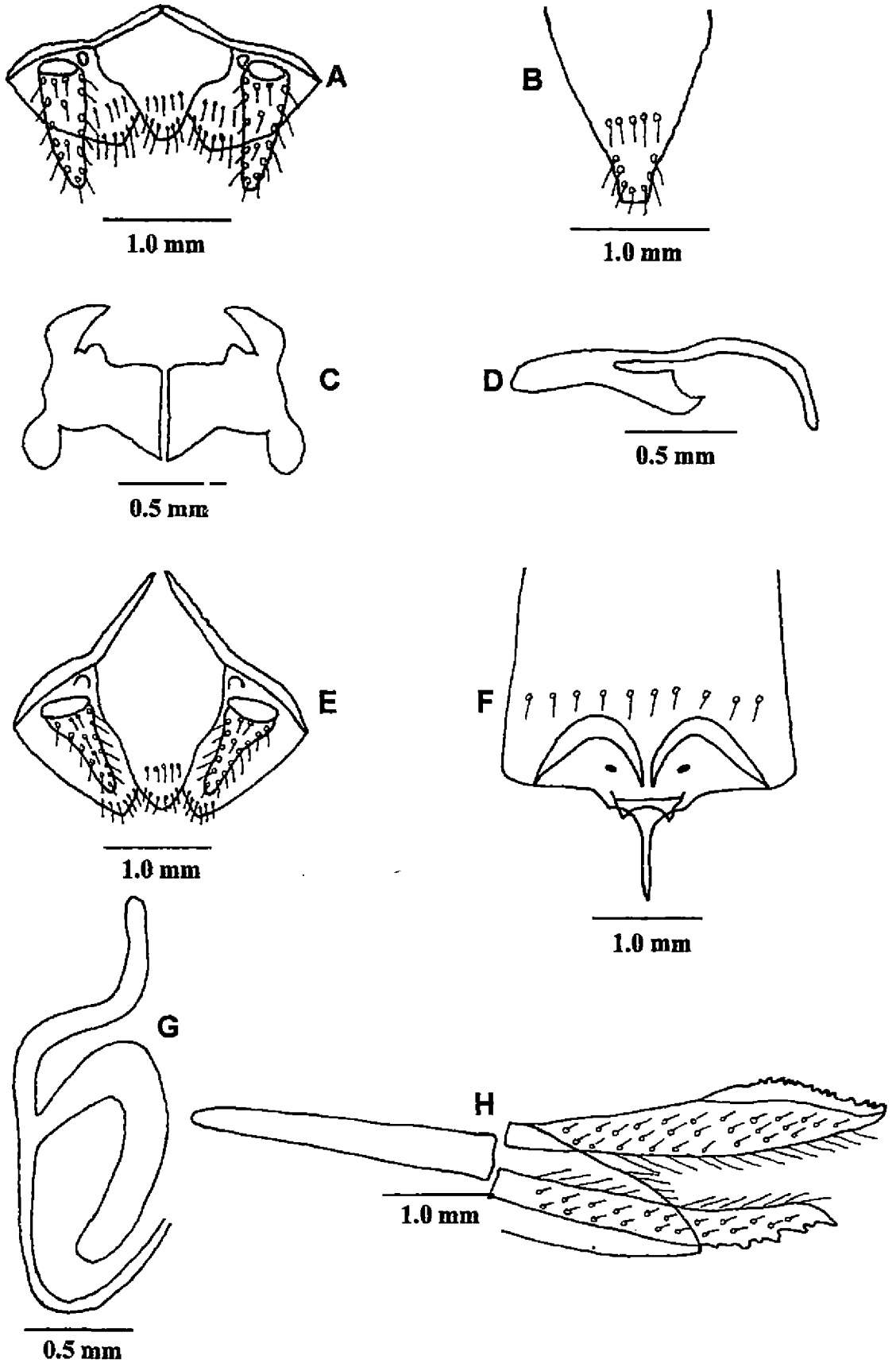


Plate 33: *Oxya velox* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

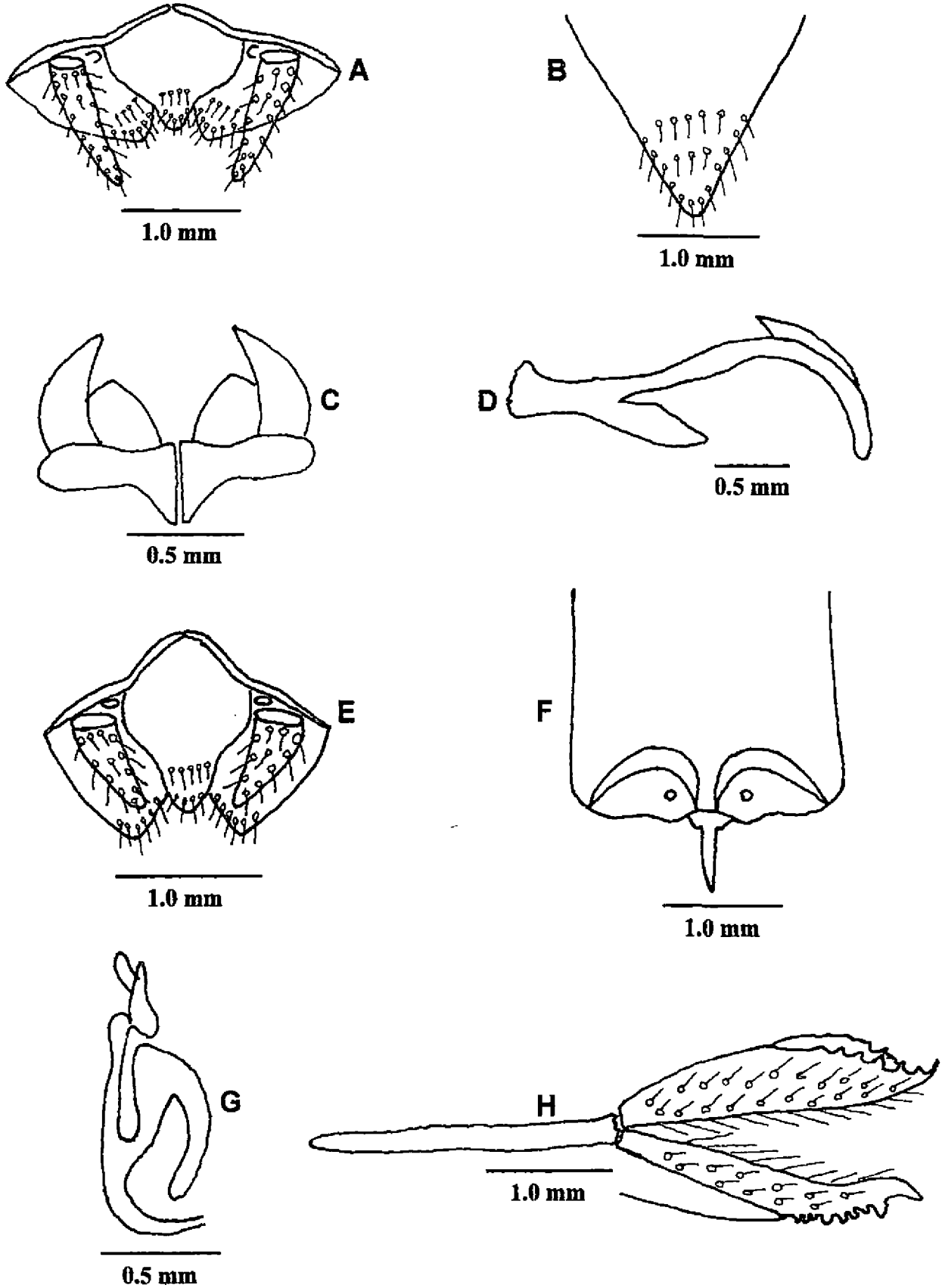


Plate 34: *Oxya chinensis* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

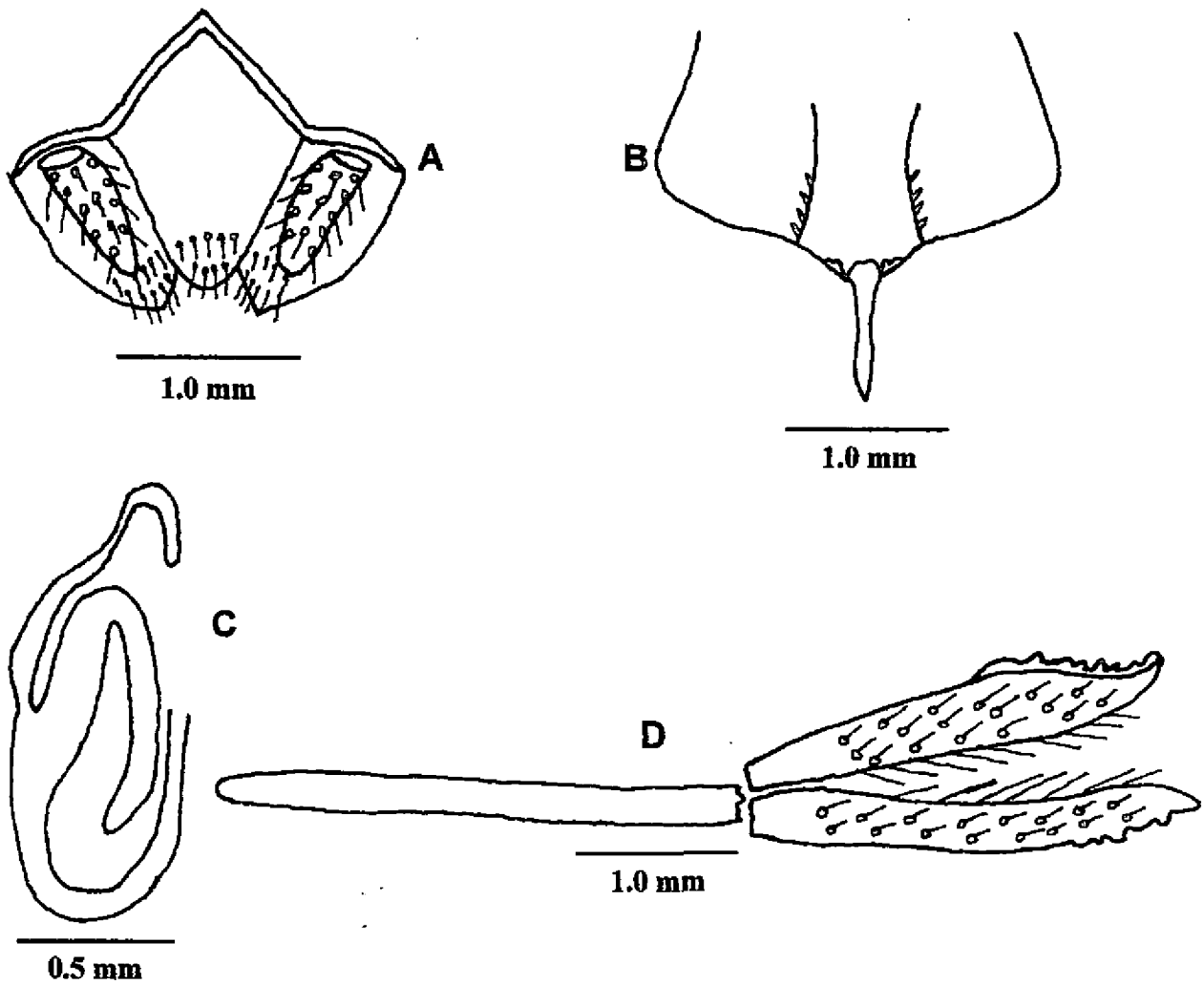


Plate 35: *Oxya hyla hyla* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

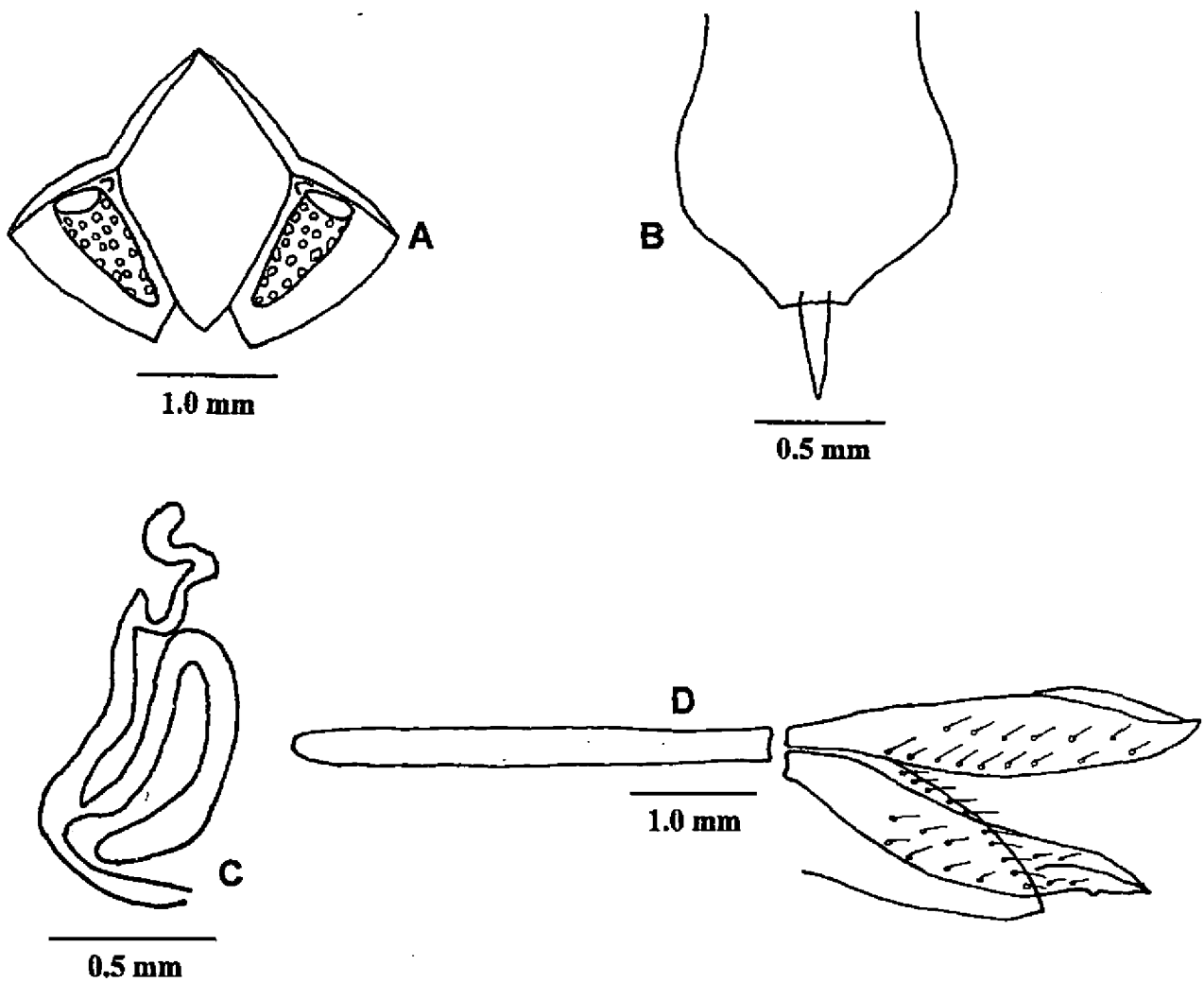


Plate 36: *Caryanda paravicina* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

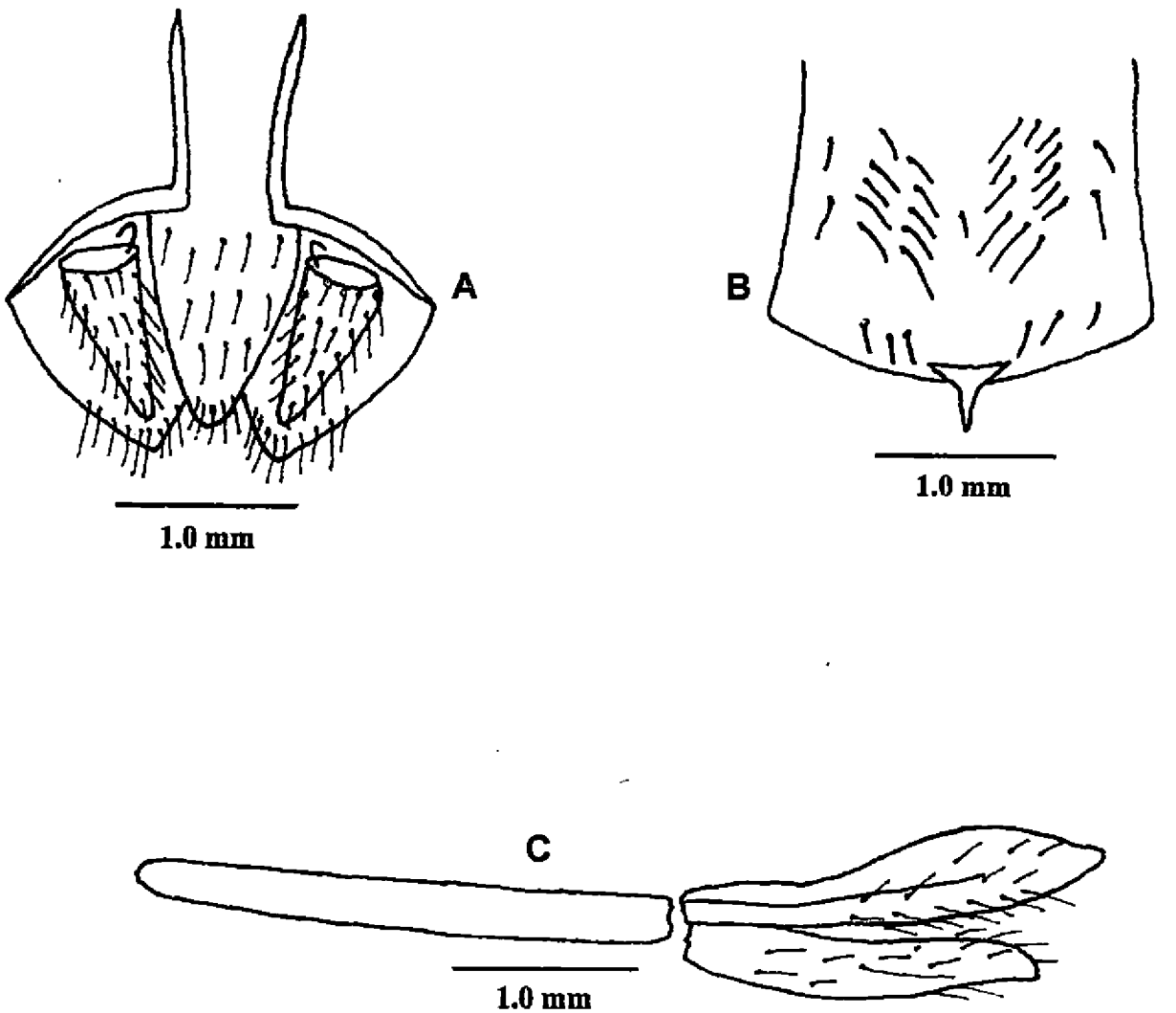


Plate 37: *Cercina mussoriensis* (female) A. Supra anal plate, B. Subgenital plate, C. Ovipositor

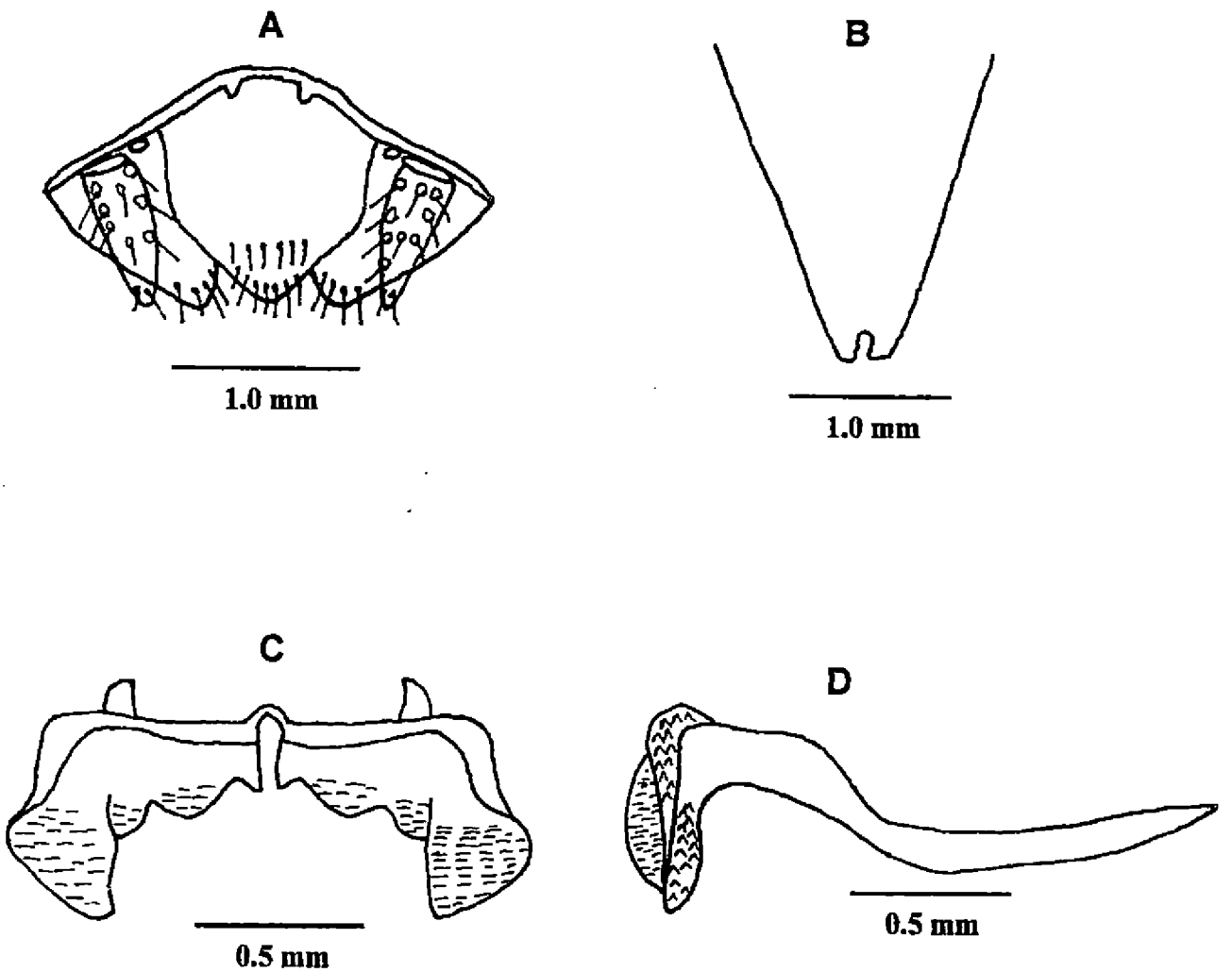


Plate 38: *Lemba elongata* sp.n (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus

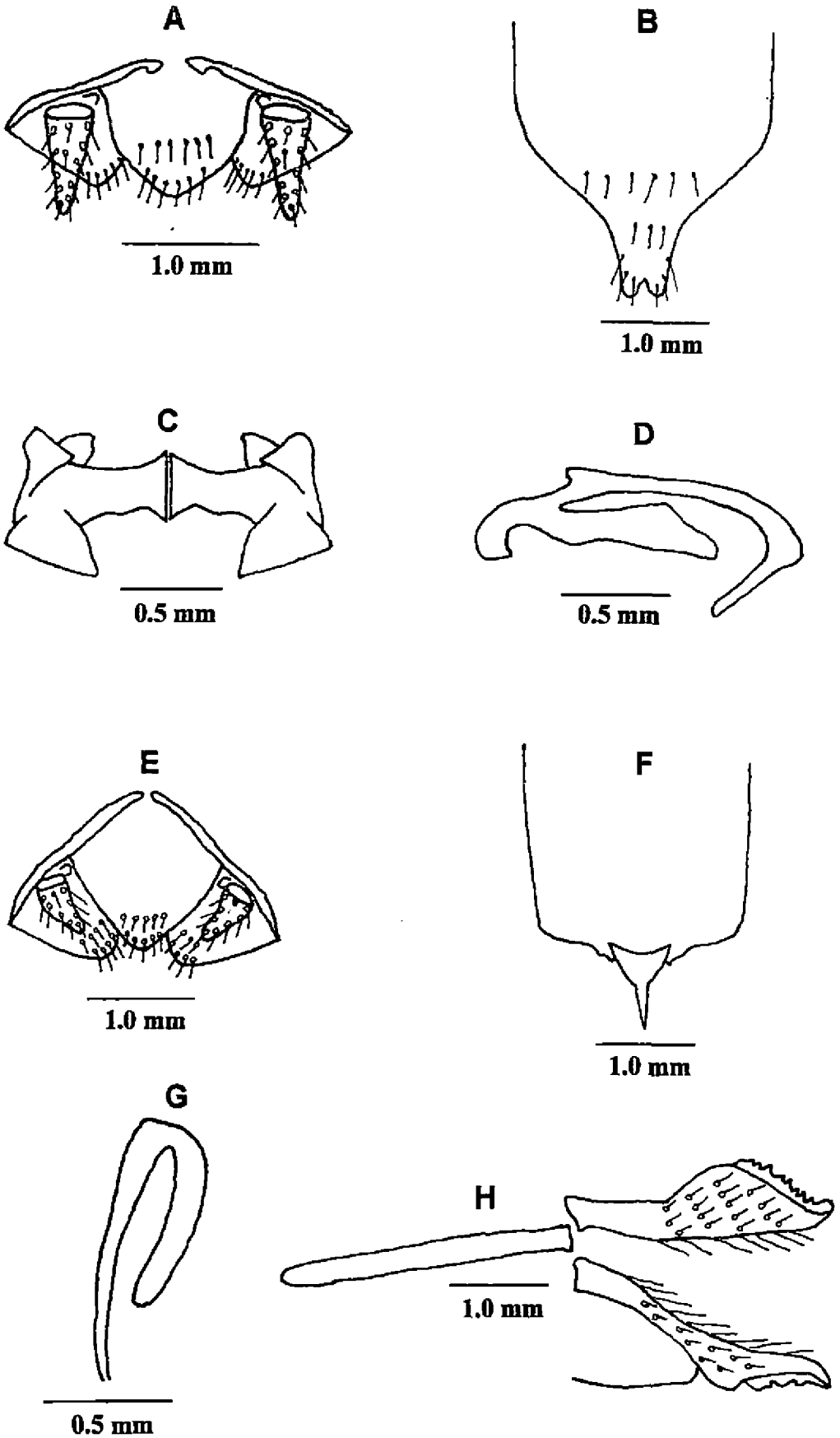


Plate 39: *Lemba motinagar* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

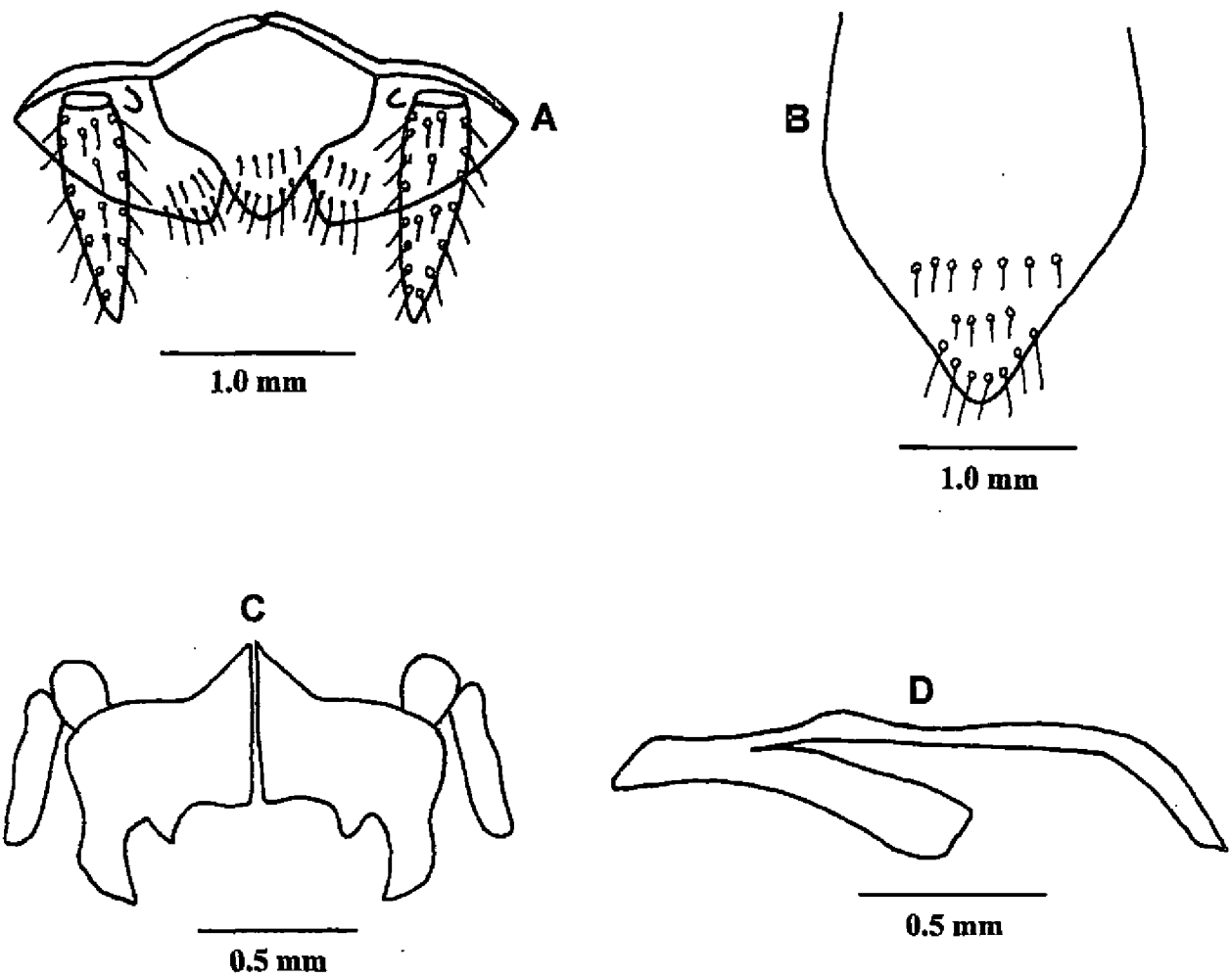


Plate 40: *Pseudoxya diminuta* (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus

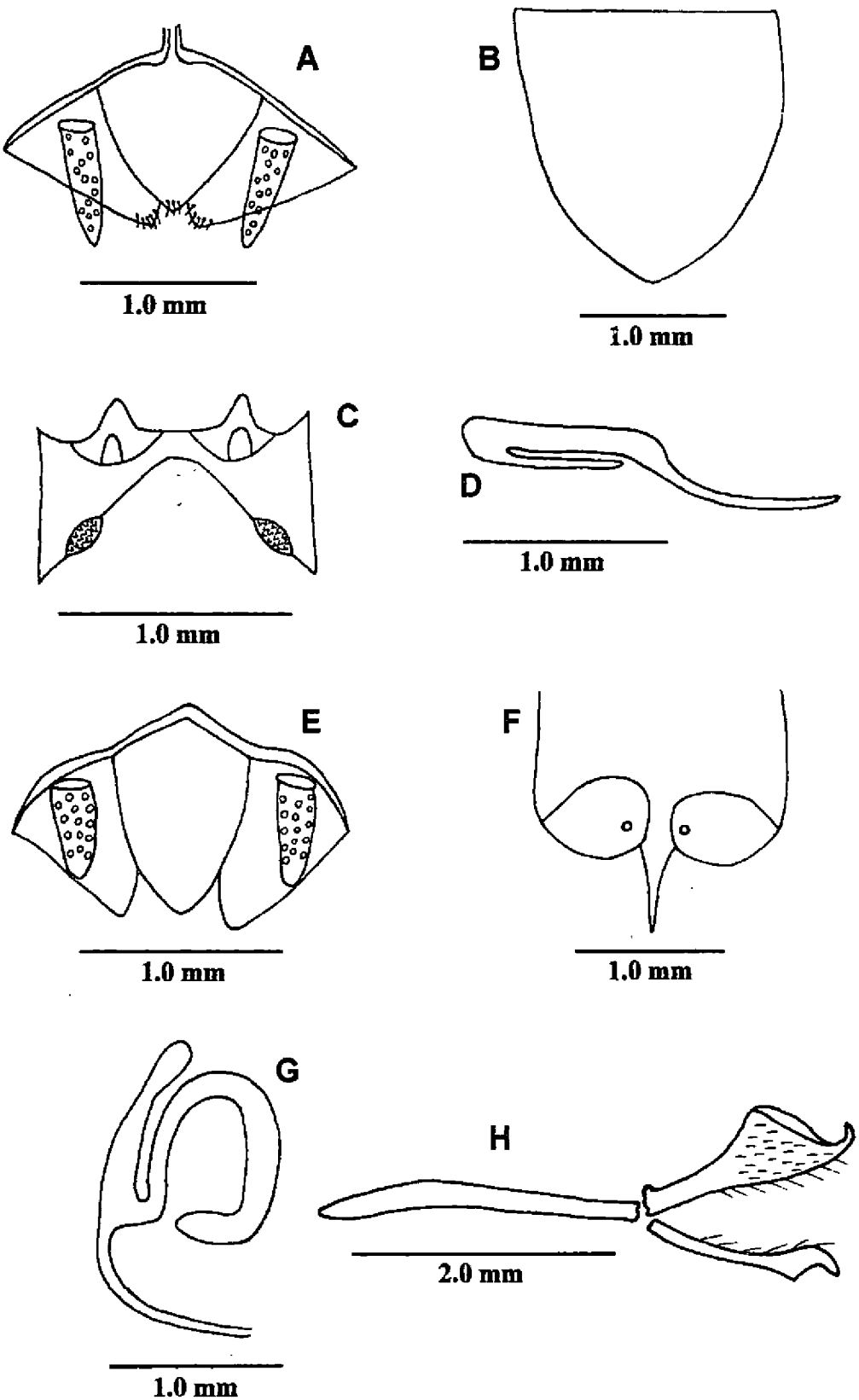


Plate 41: *Spathosternum p. prasiniferum* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

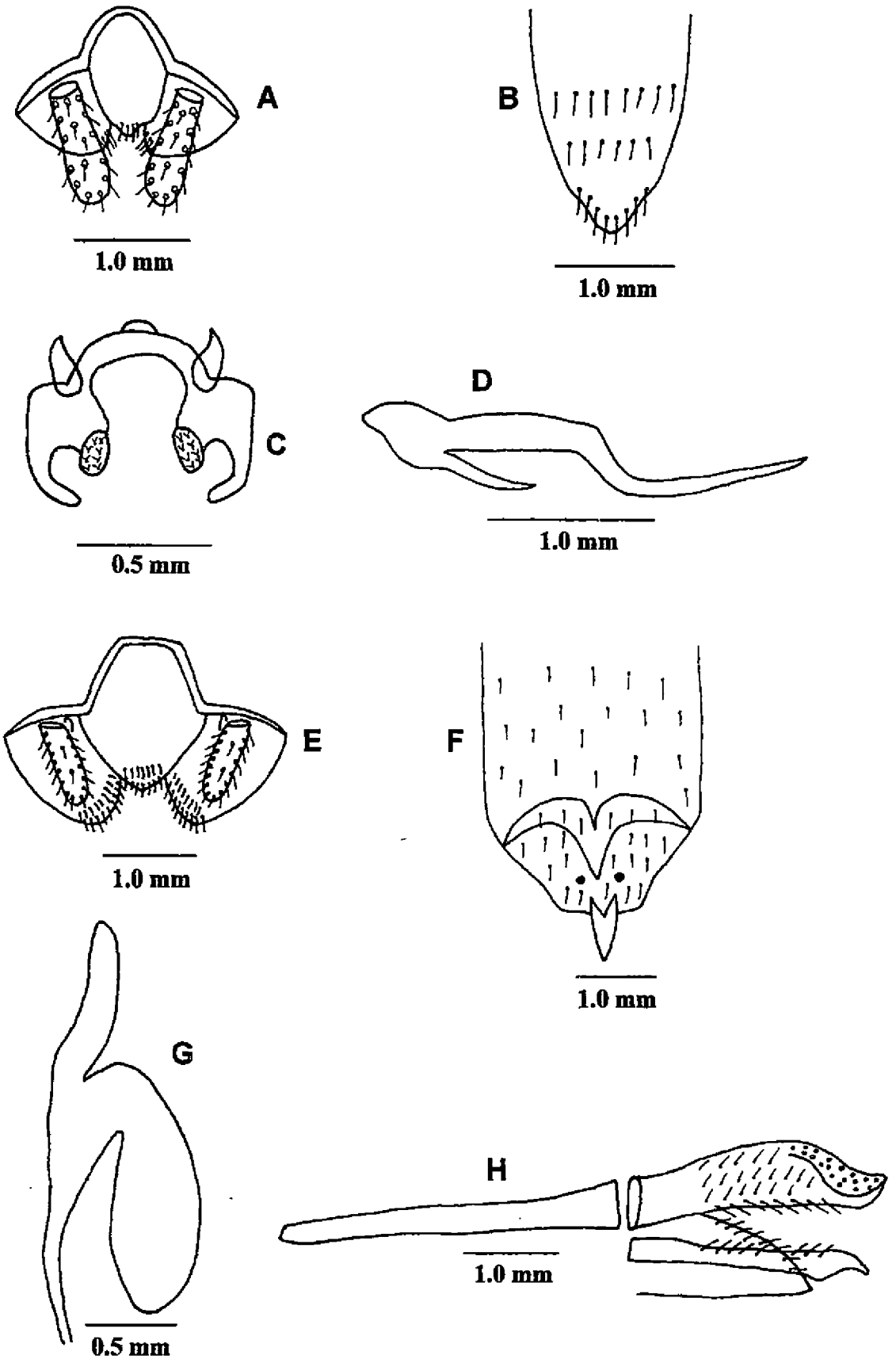


Plate 42: *Neooxyrrhepes meghalayensis* gen. n. sp. n. A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

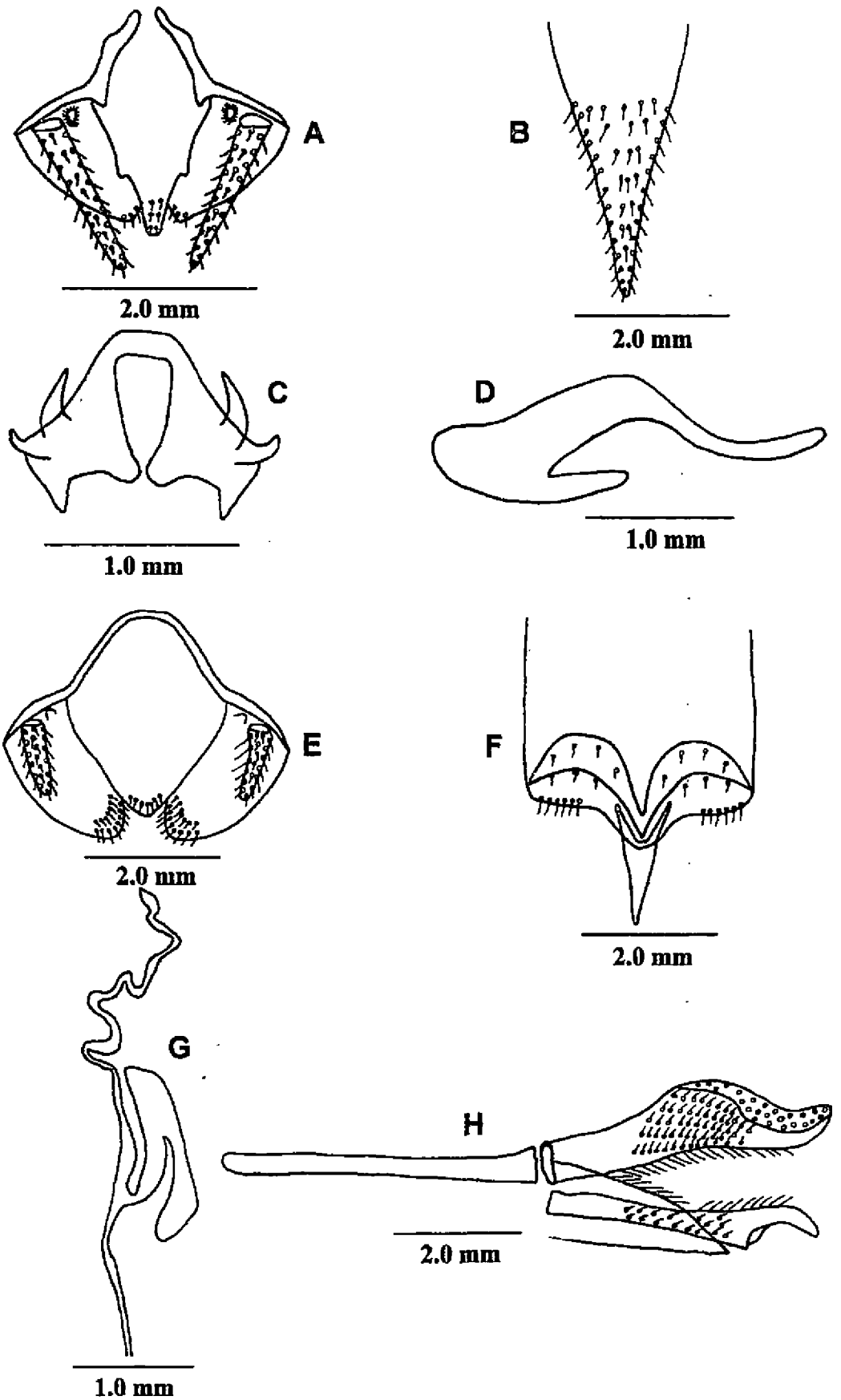


Plate 43: *Oxyrrhepes obtusa* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

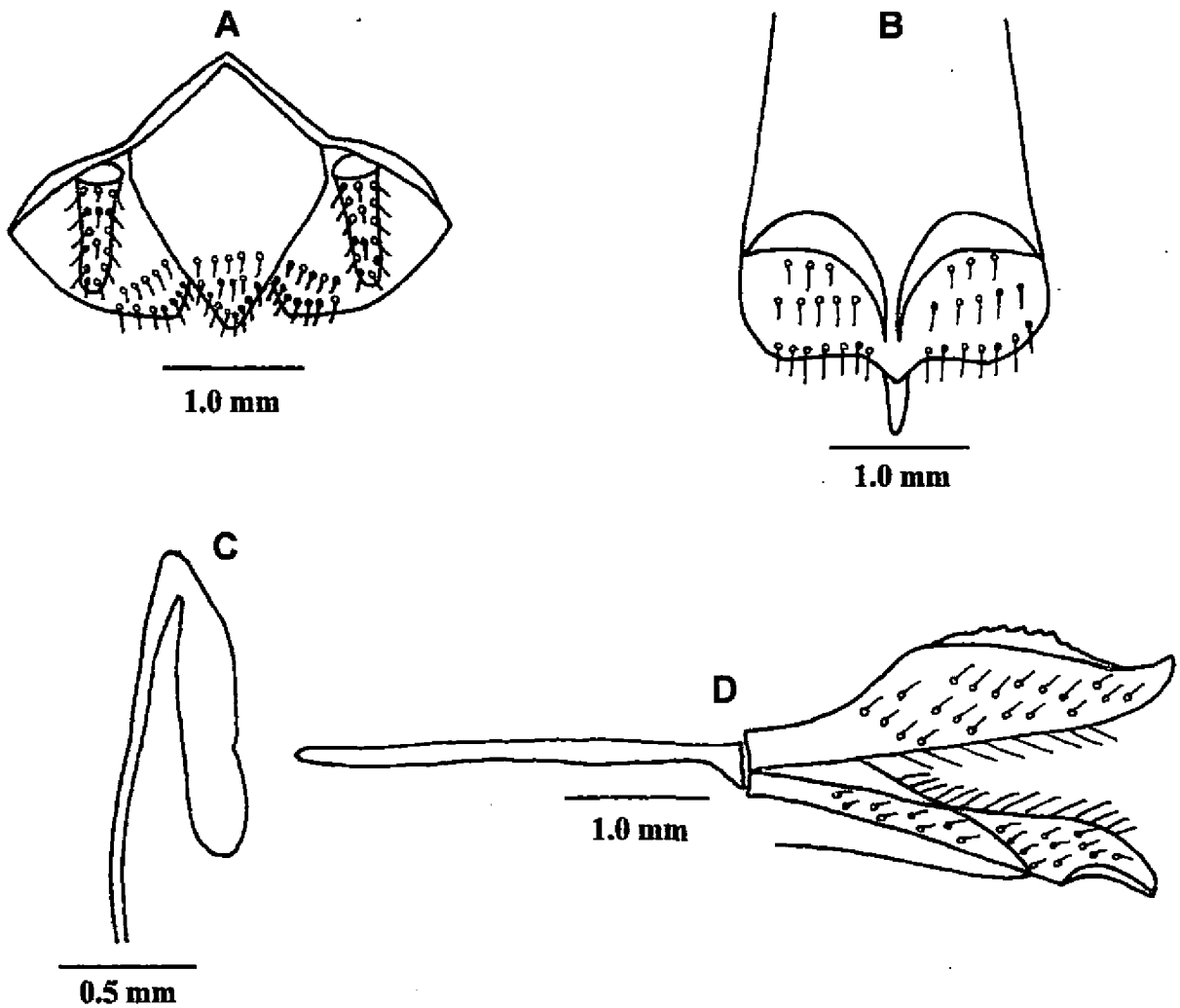


Plate 44: *Tristria pulvinata* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

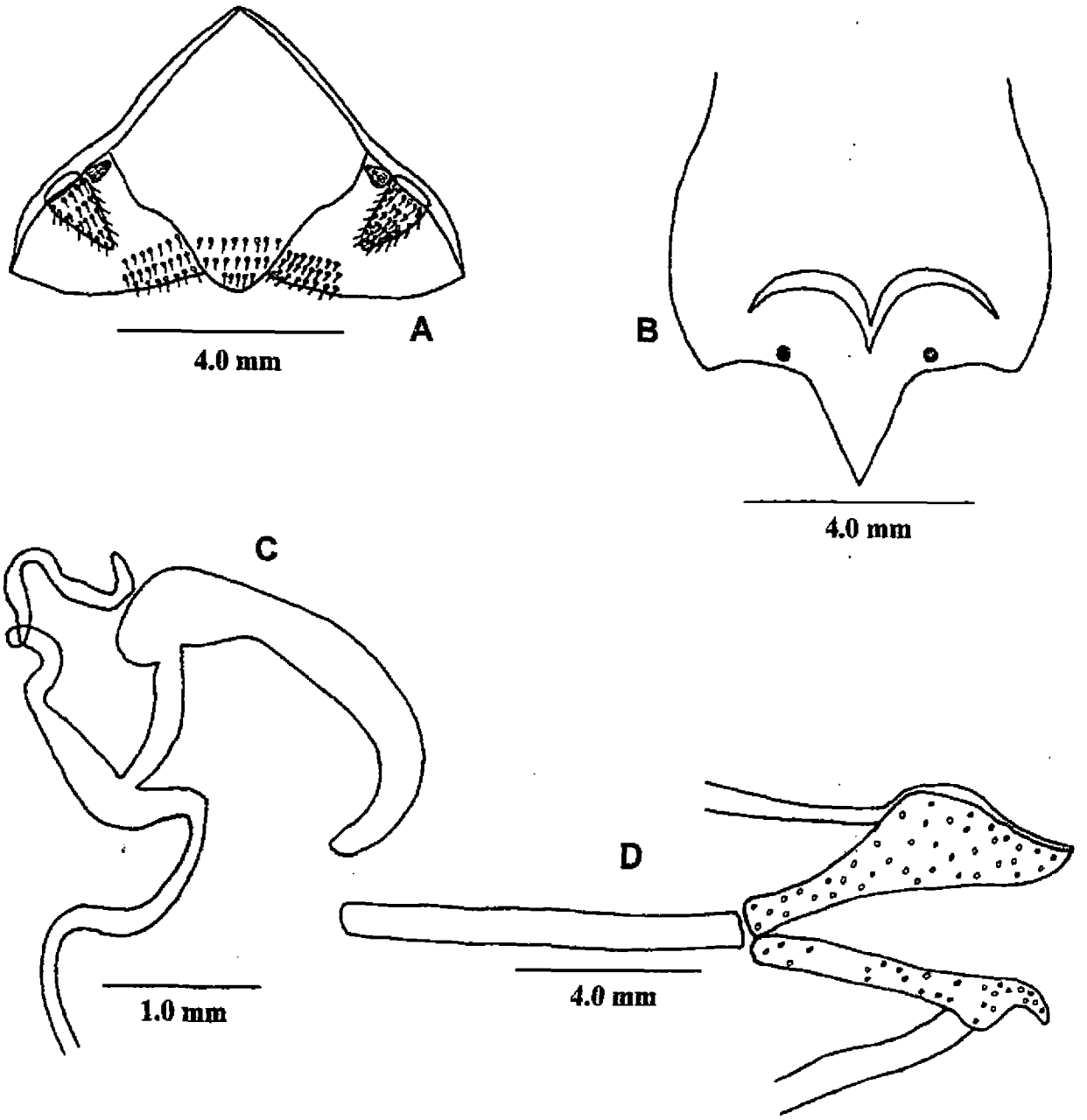


Plate 45: *Chondracris rosea* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

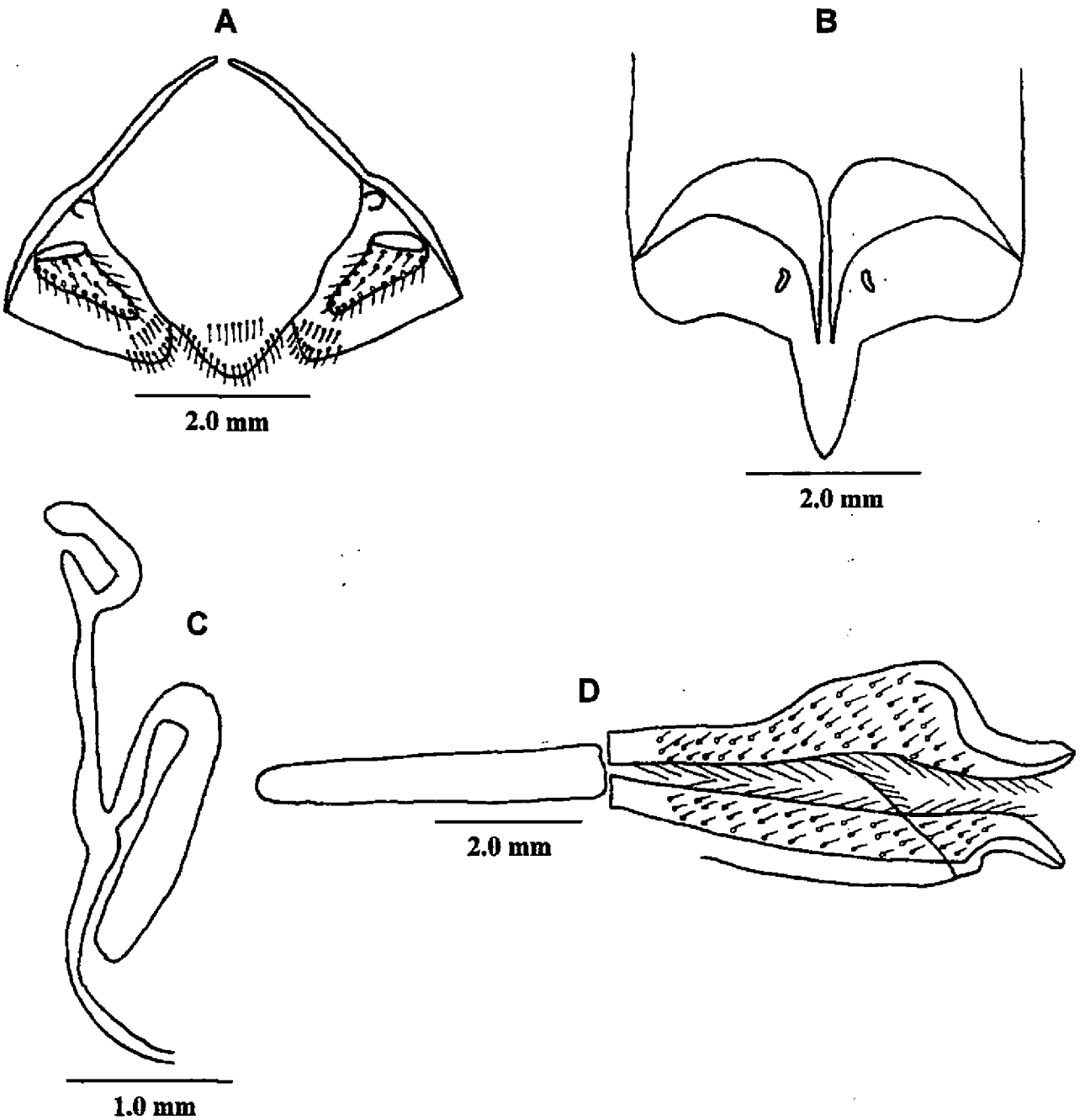


Plate 46: *Patanga succinata* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

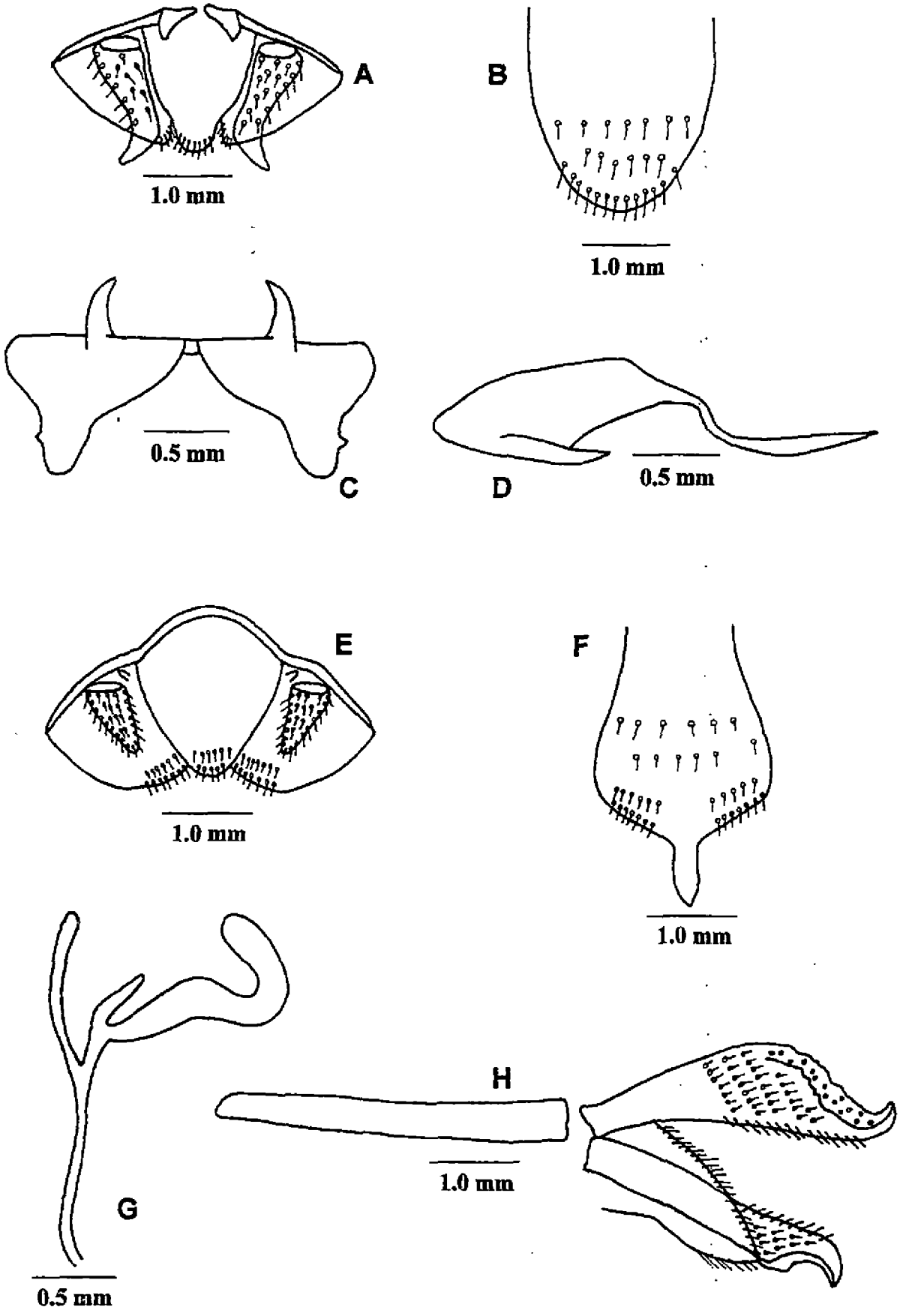


Plate 47: *Eucoptacra praemorsa* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

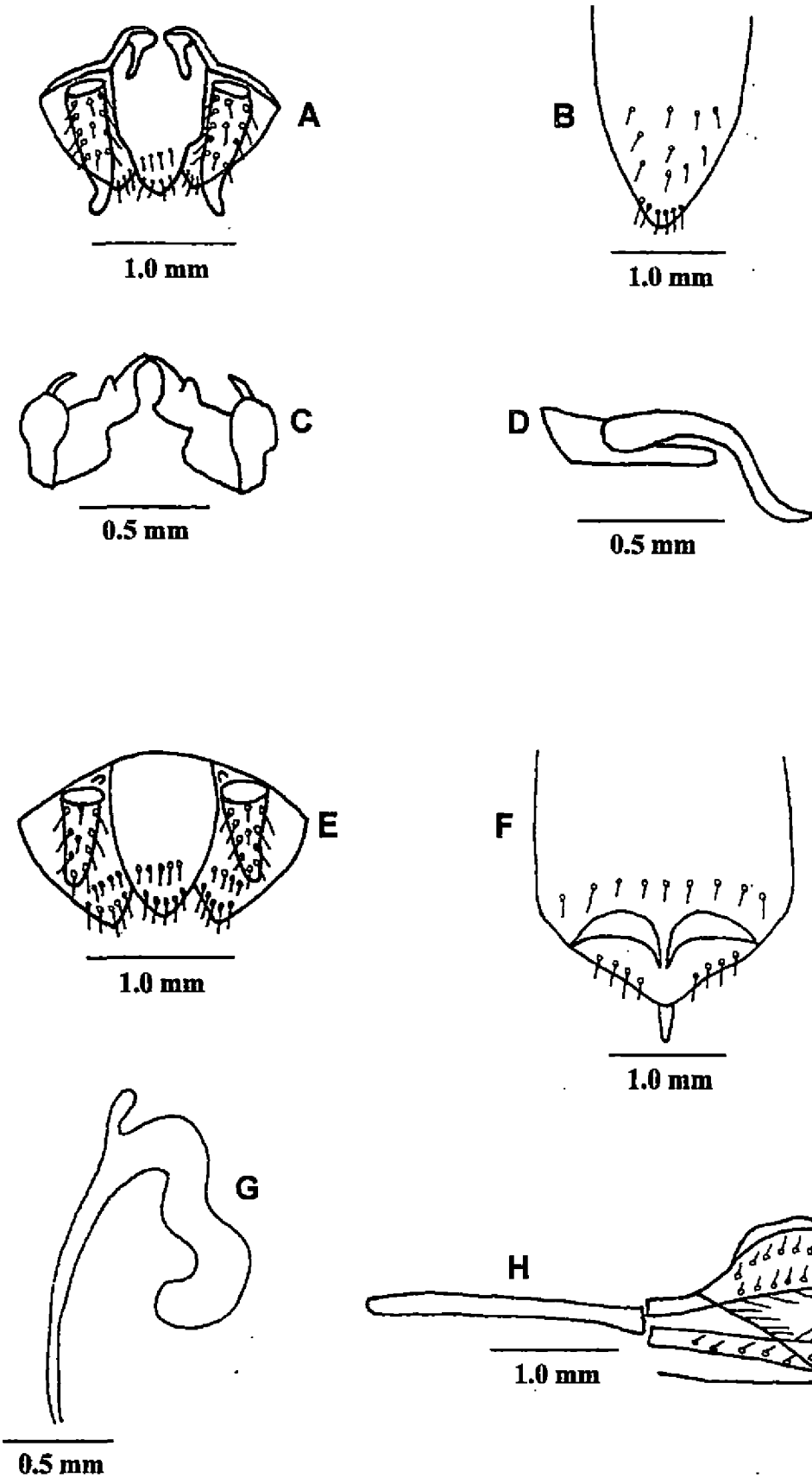


Plate 48: *Epistauras abberans* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

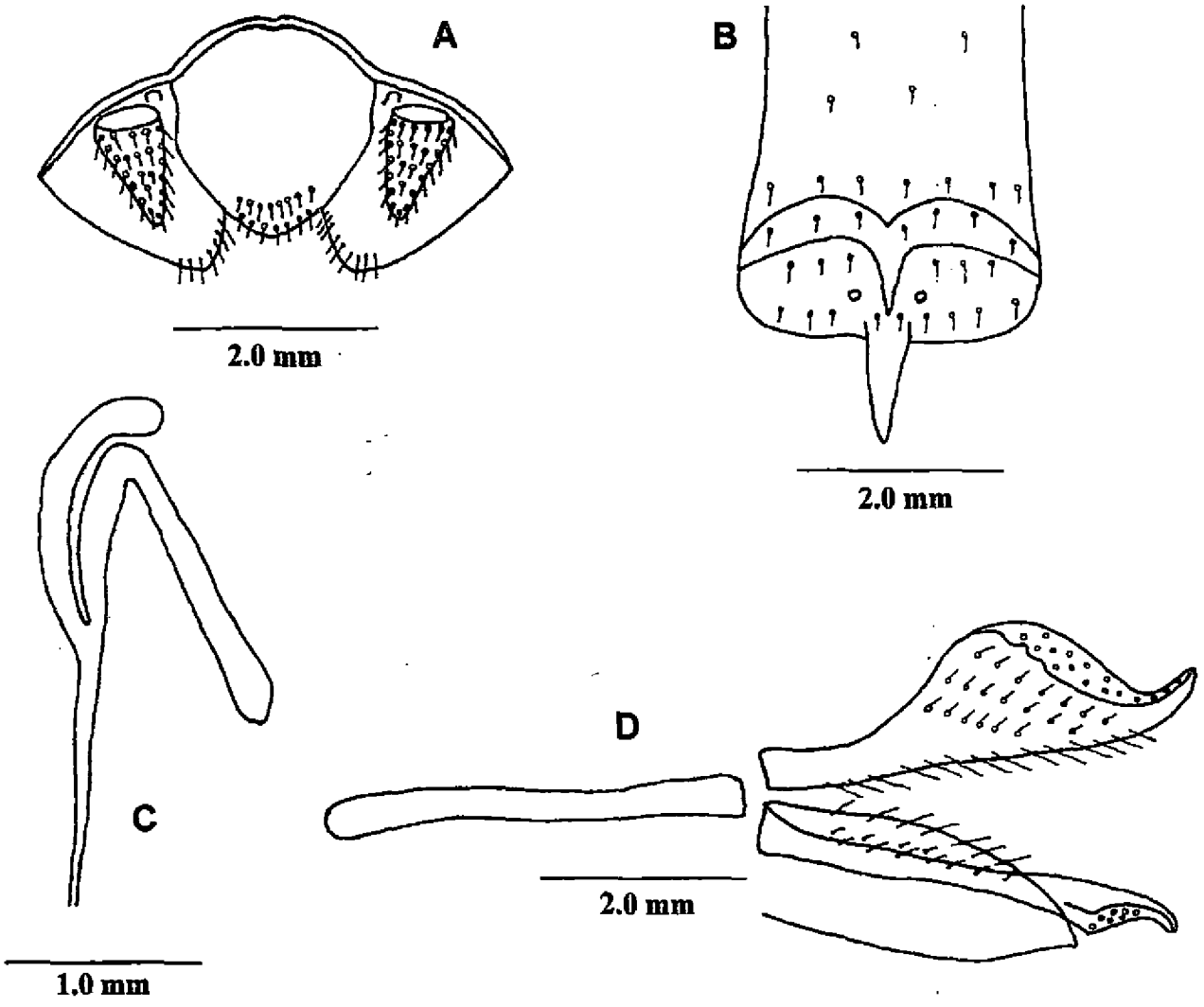


Plate 49: *Eyprepocnemis a. alacris* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

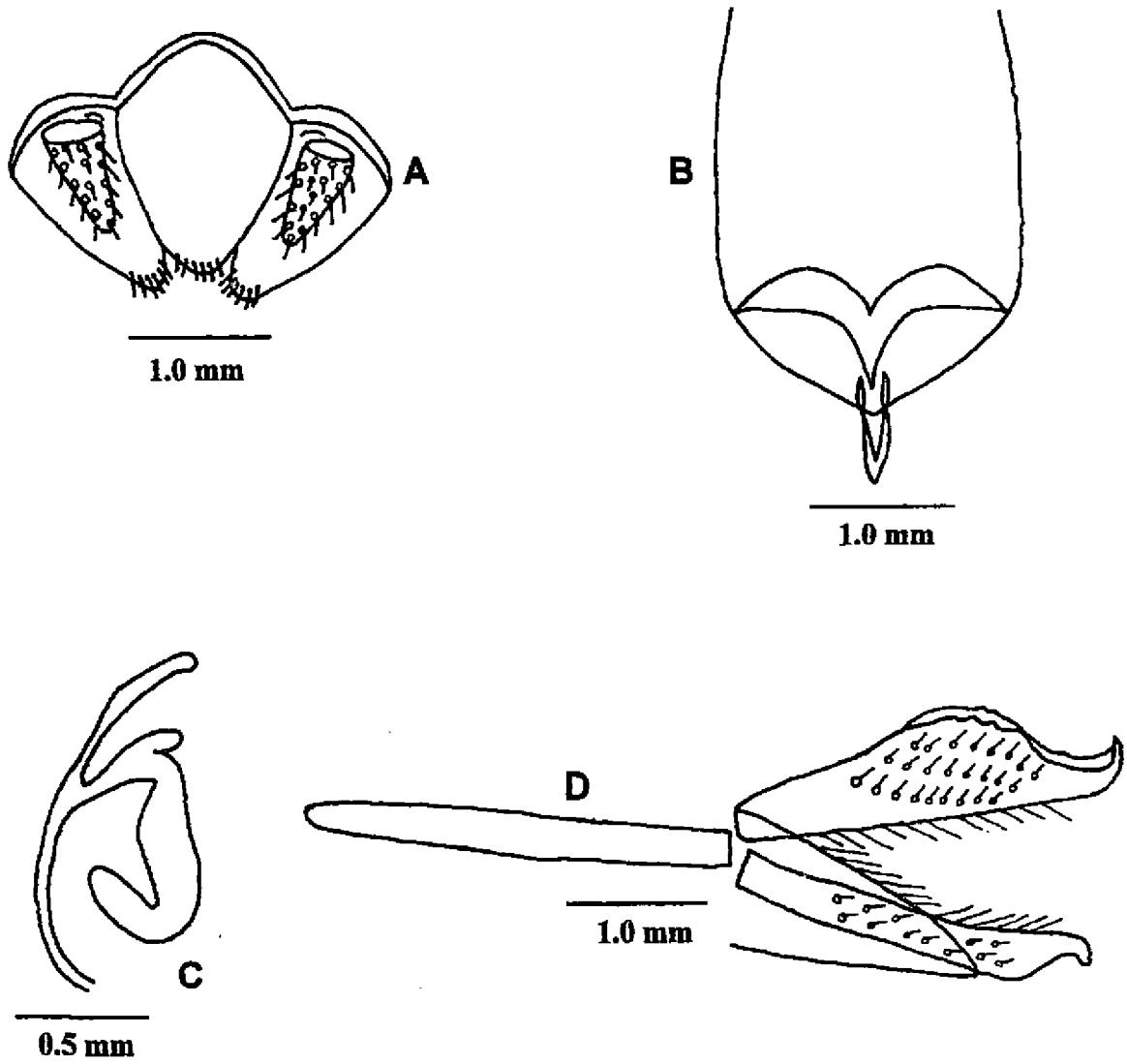


Plate 50: *Catantops erubescens* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

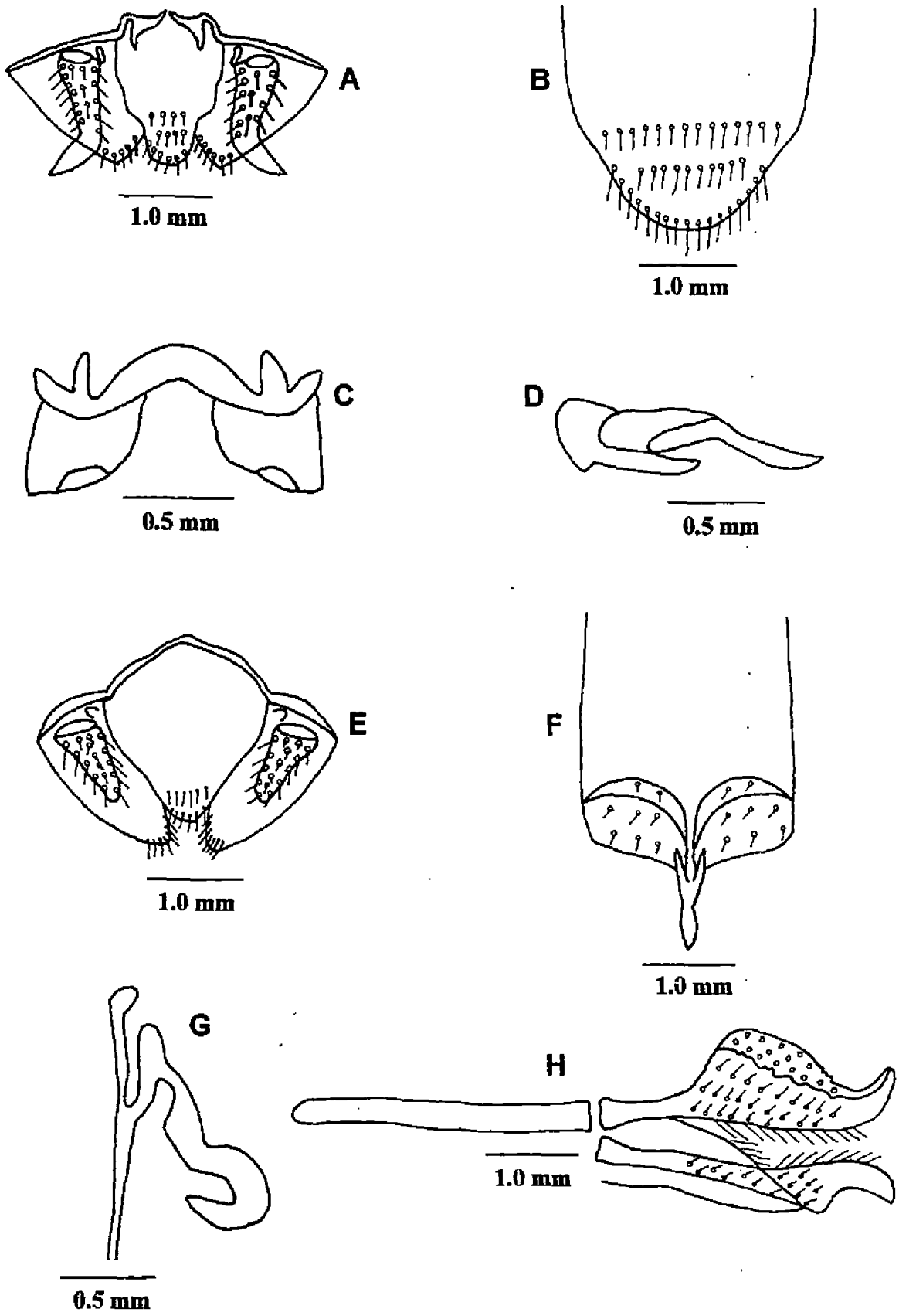


Plate 51: *Xenocatantops humilis* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

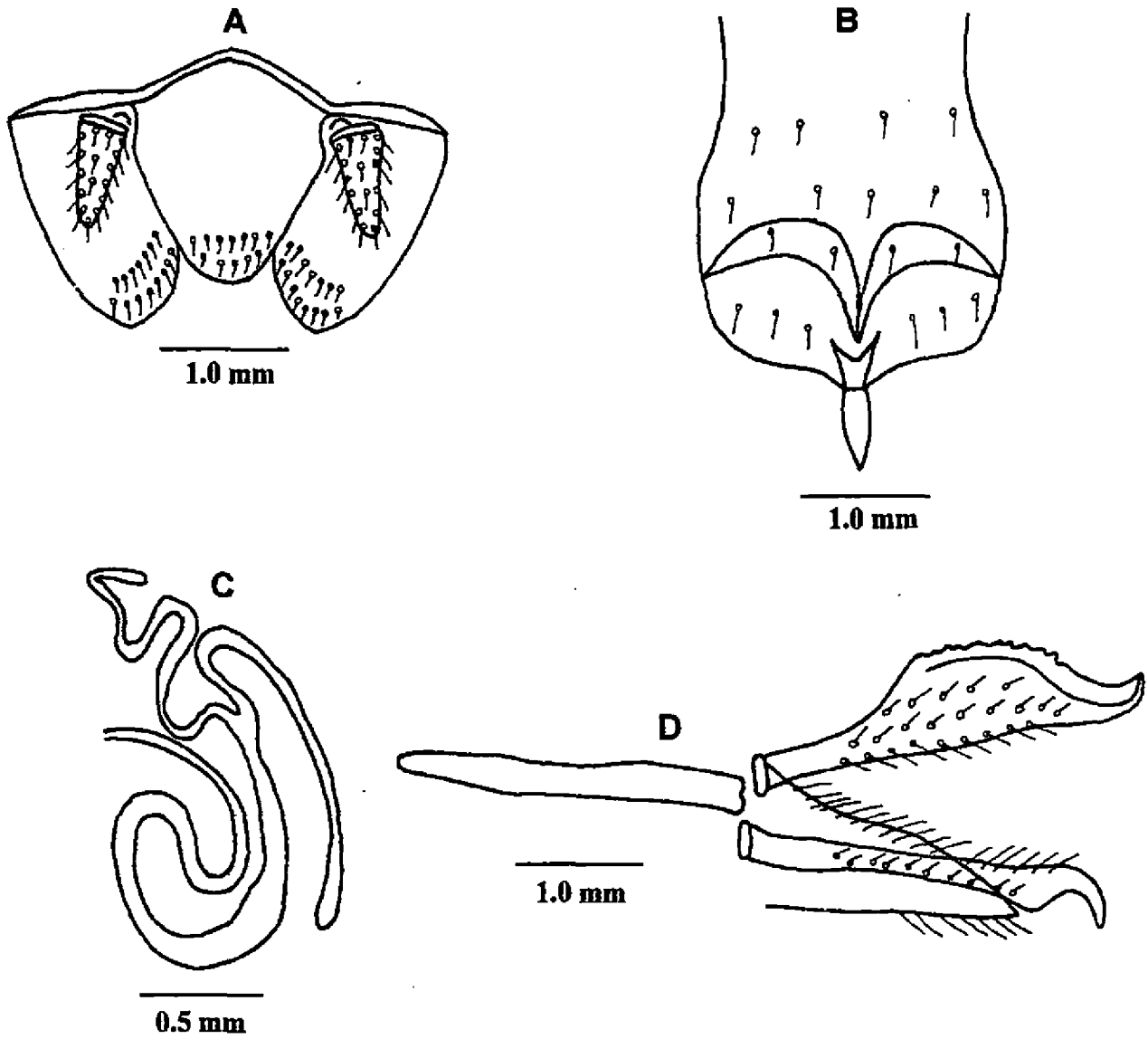


Plate 52: *Xenocatantops brachycerus* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

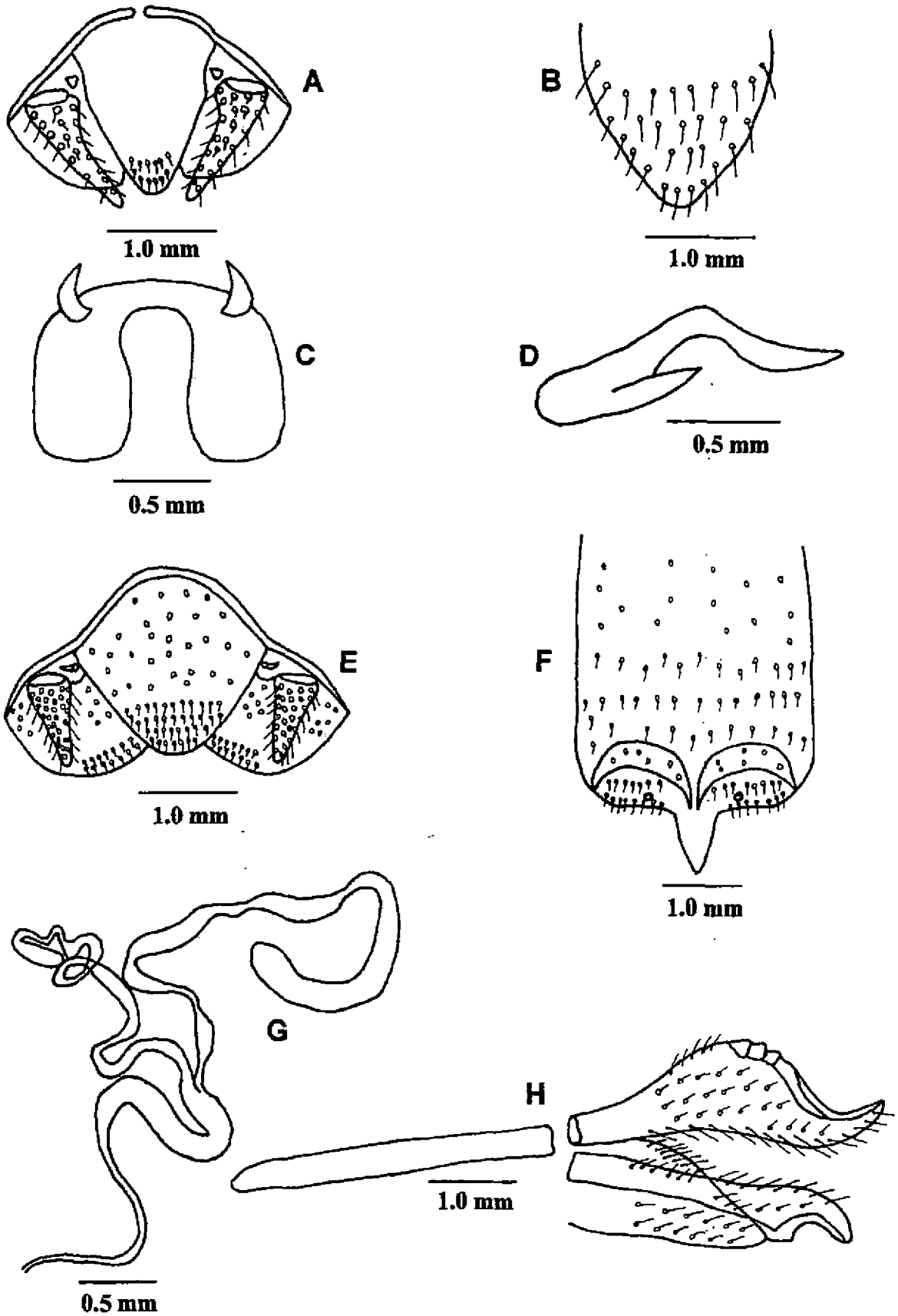


Plate 53: *Xenocatantops karnyi* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

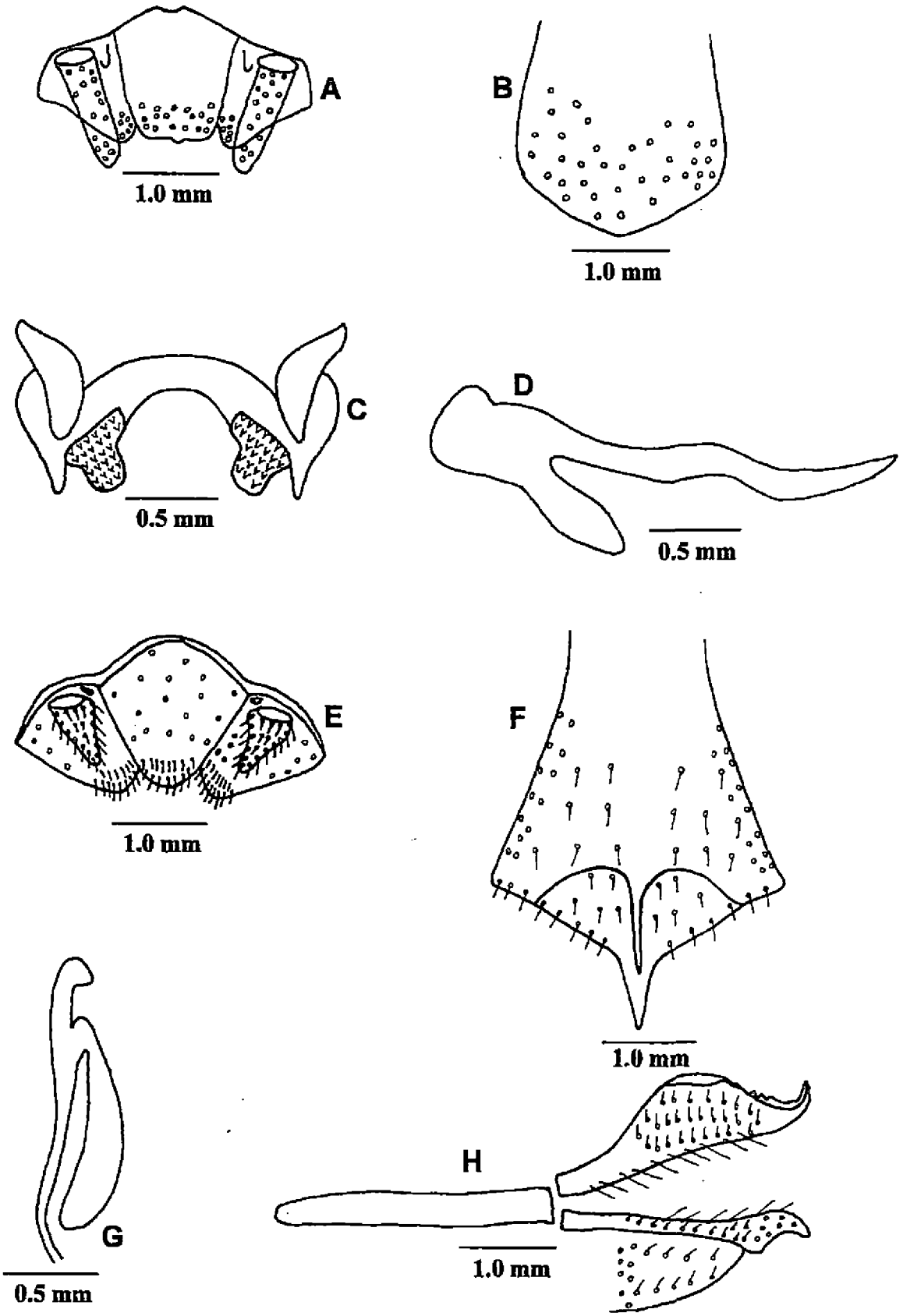


Plate 54: *Apalnicris shillong* A-D (male); E-H (female) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus, E. Supra anal plate, F. Subgenital plate, G. Spermatheca, H. Ovipositor

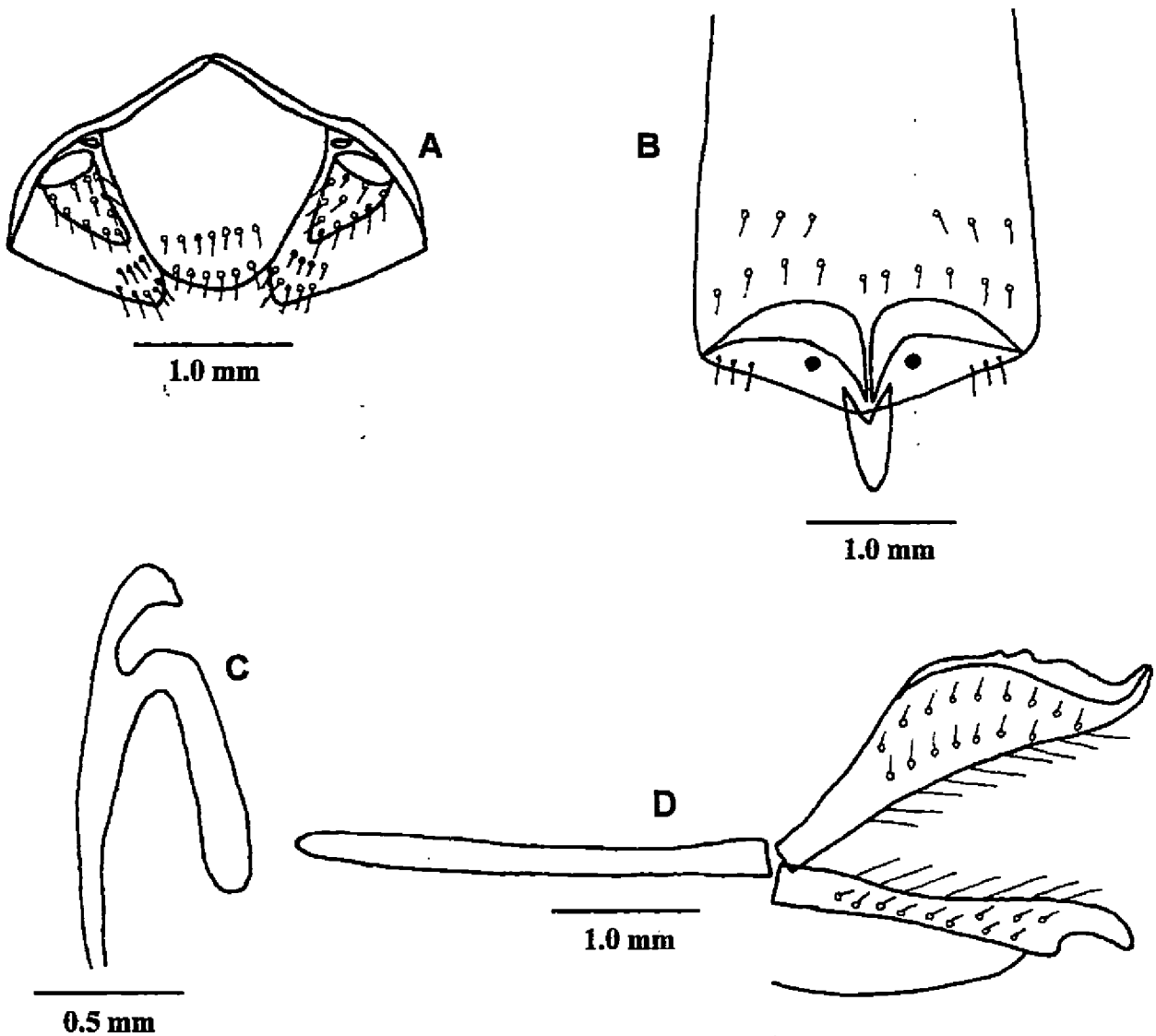


Plate 55: *Palniacris rugulosa* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

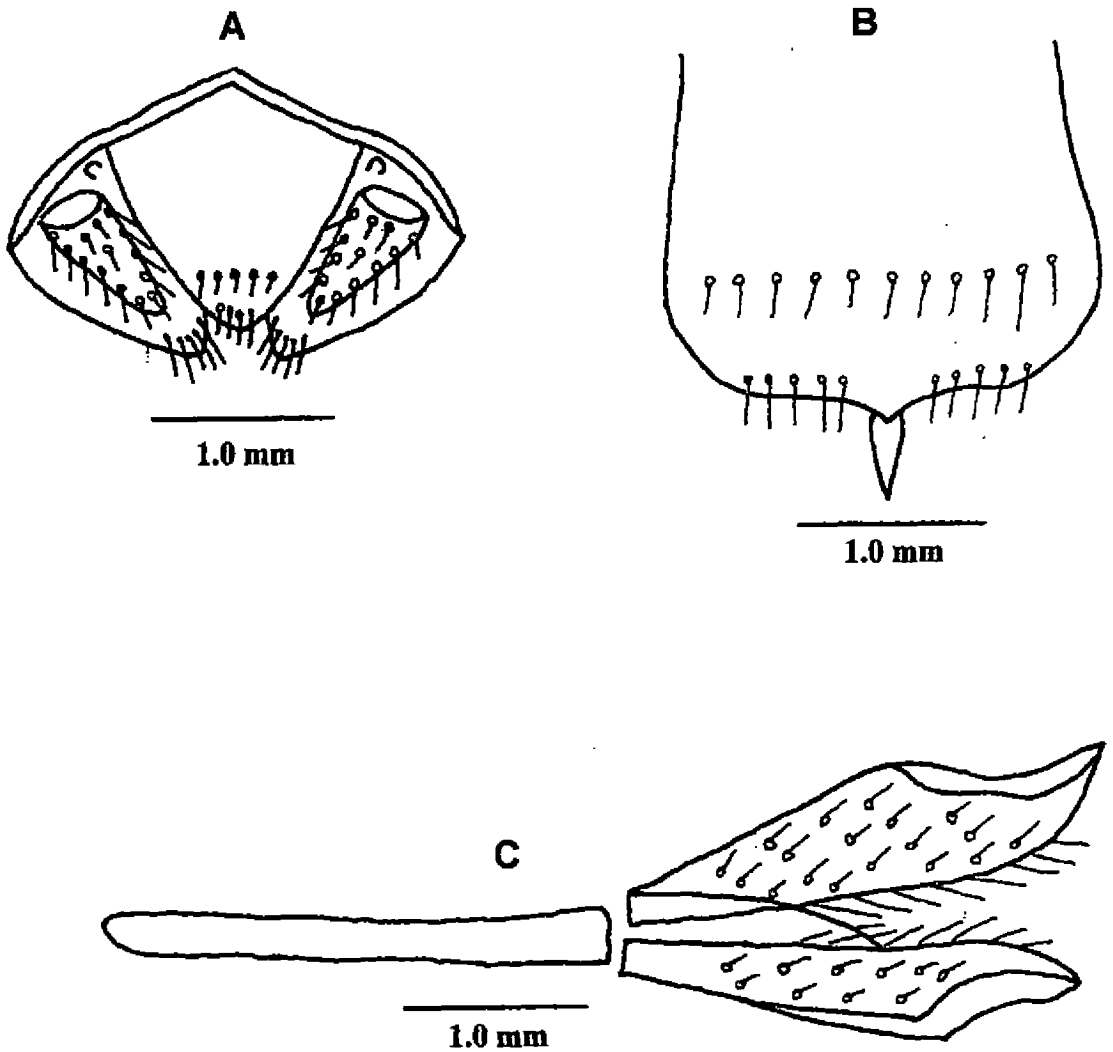


Plate 56: *Gerenia pustulipennis* (female) A. Supra anal plate, B. Subgenital plate, C. Ovipositor

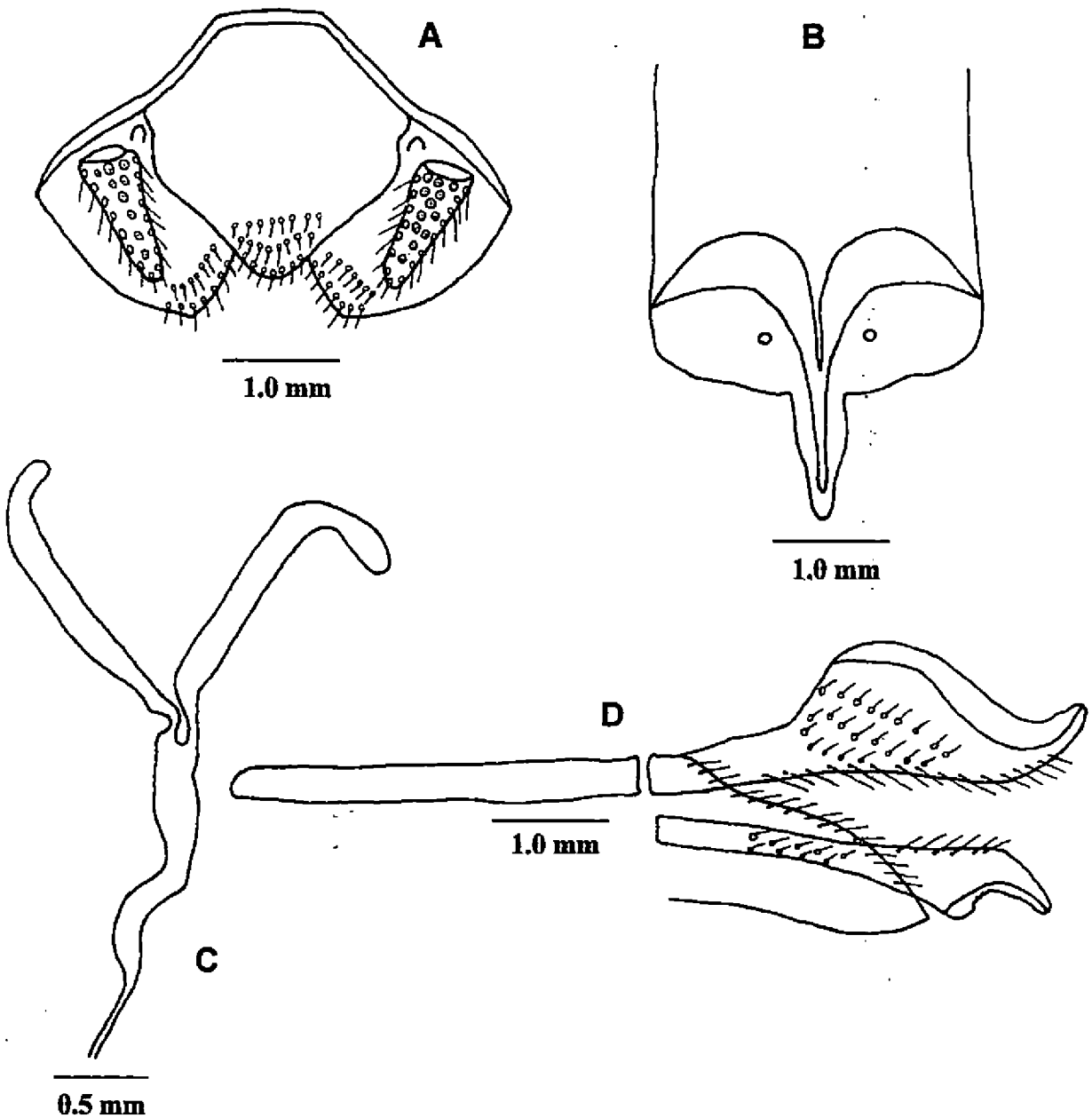


Plate 57: *Diabolocatantops consobrinus* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

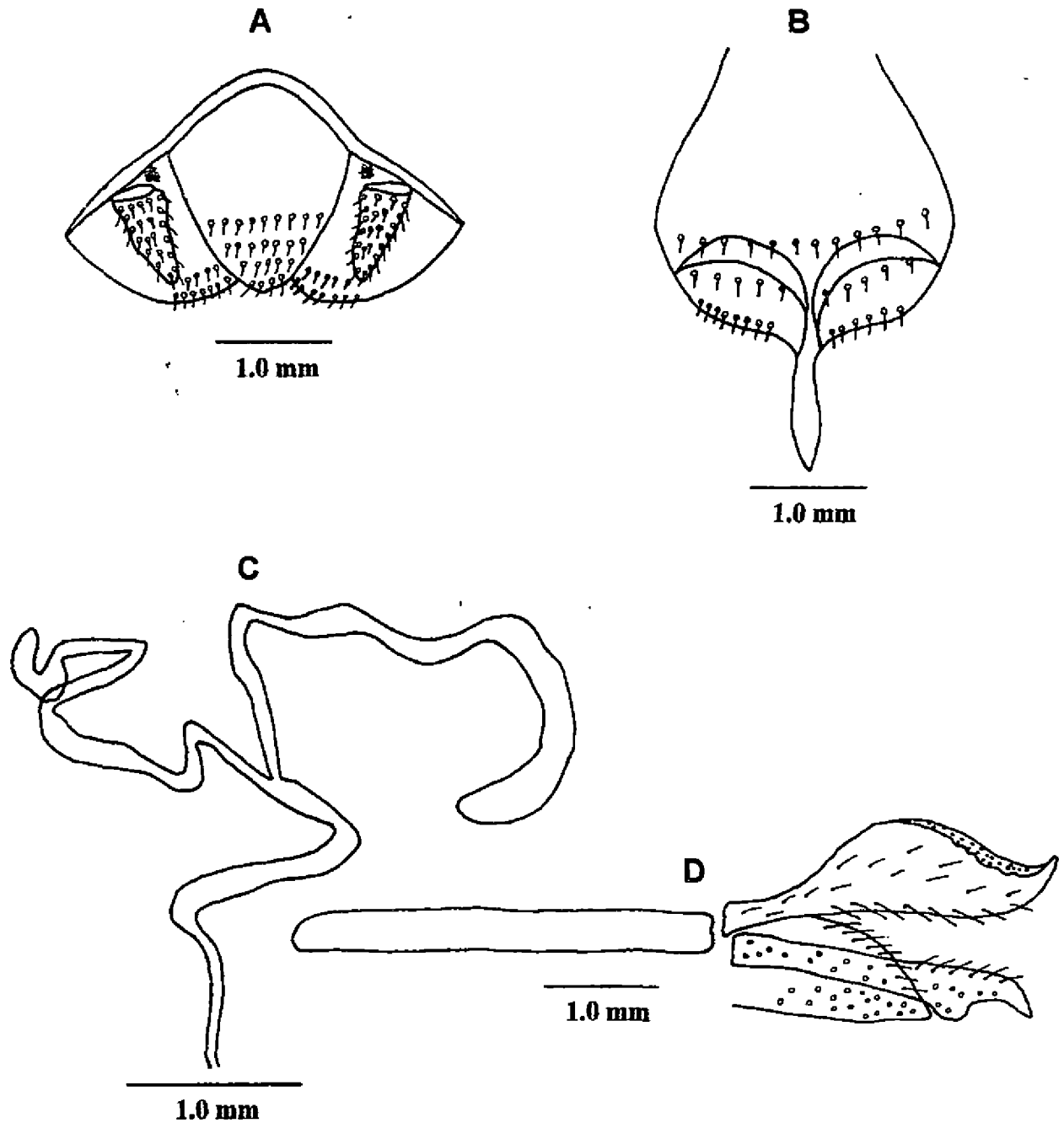


Plate 58: *Stenocatantops splendens* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

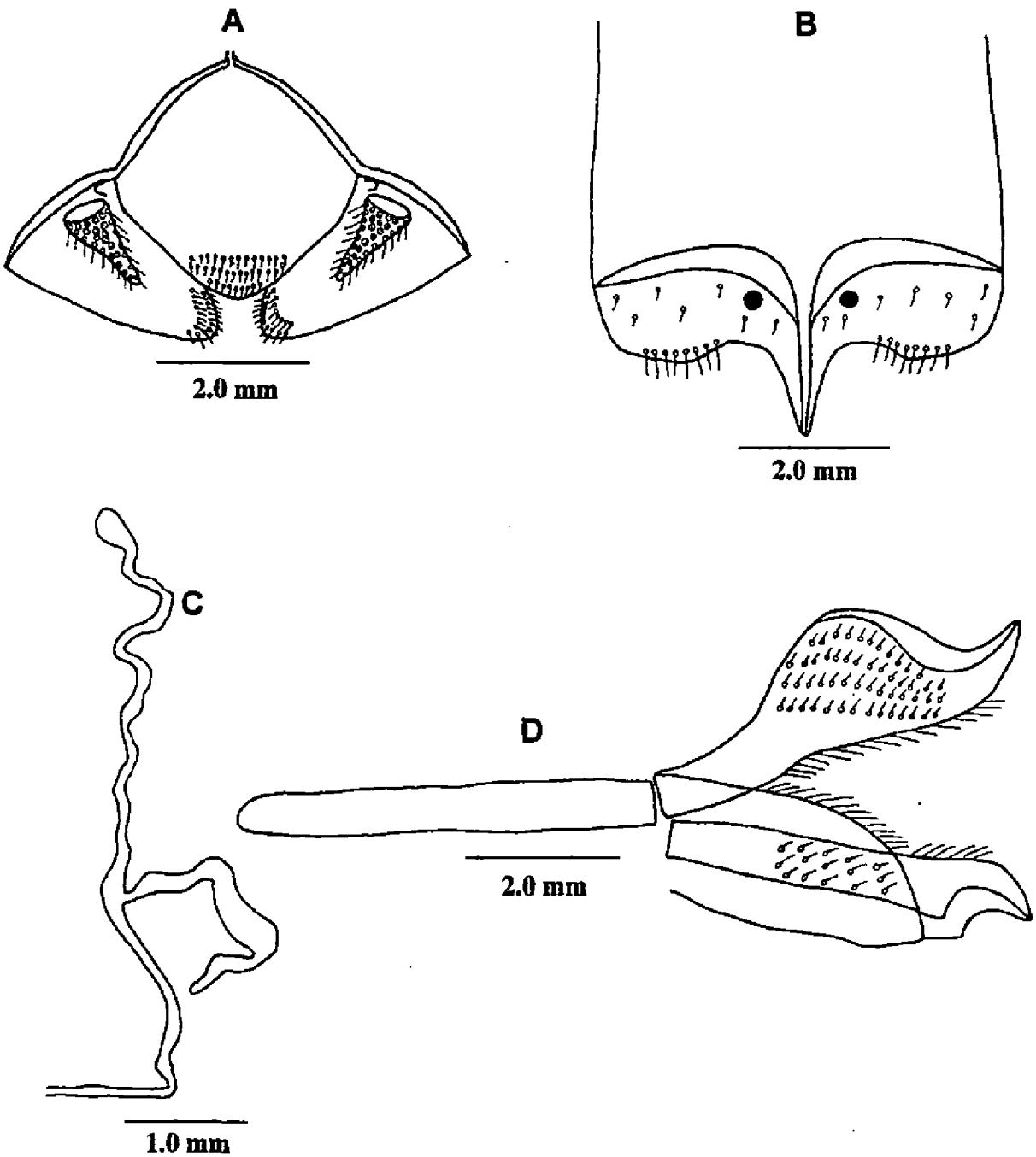


Plate 59: *Pachyacris violascens* (female) A. Supra anal plate, B. Subgenital plate, C. Spermatheca, D. Ovipositor

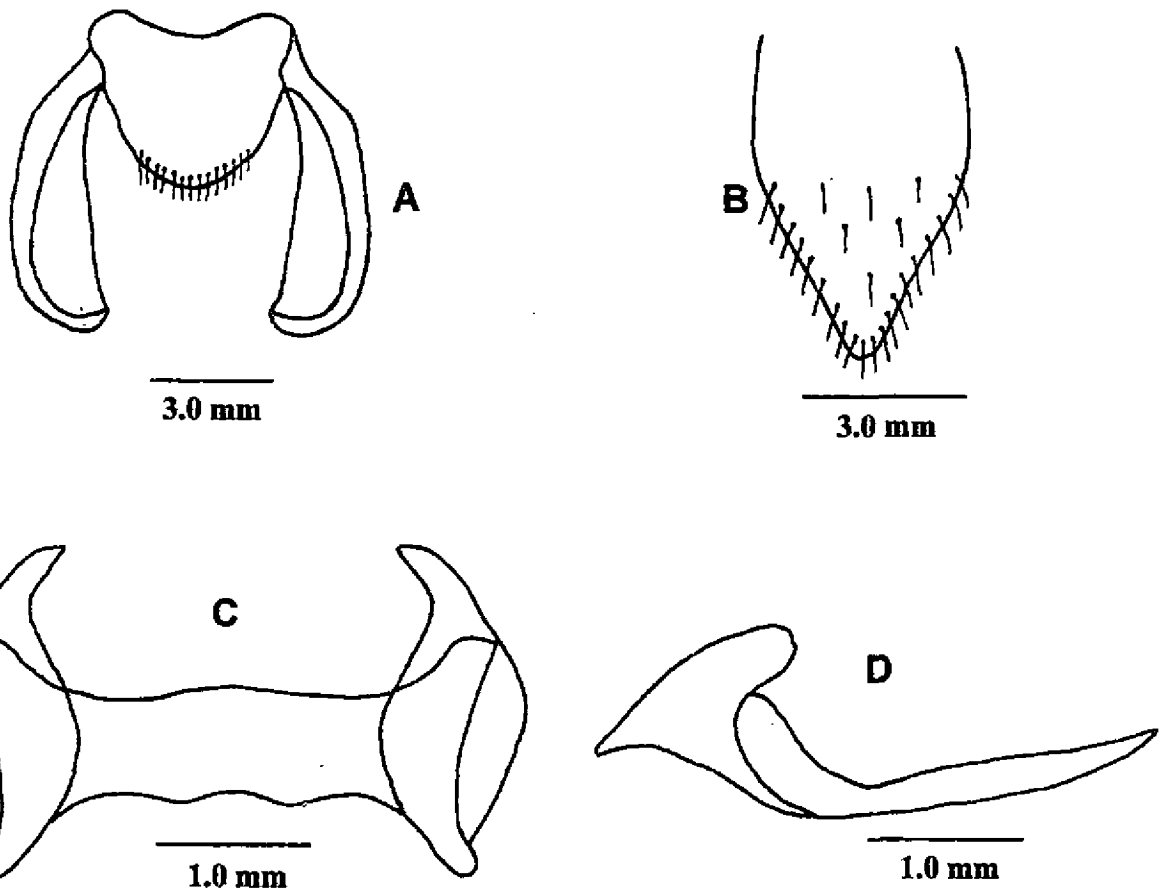


Plate 60: *Choreodocus robustus* (male) A. Supra anal plate, B. Subgenital plate, C. Epiphallus, D. Aedeagus

Figures

Female

Fig. 1: *Brachycrotaphus longiceps*

Male

Fig. 2: *Leva indica*

Male

Fig. 3: *Dociostaurus (D.) apicalis*

Female

Fig. 4: *Aulacobothrus taeniatus*

A). Male B). Female

Fig. 5: *Chorthippus indus*

Female

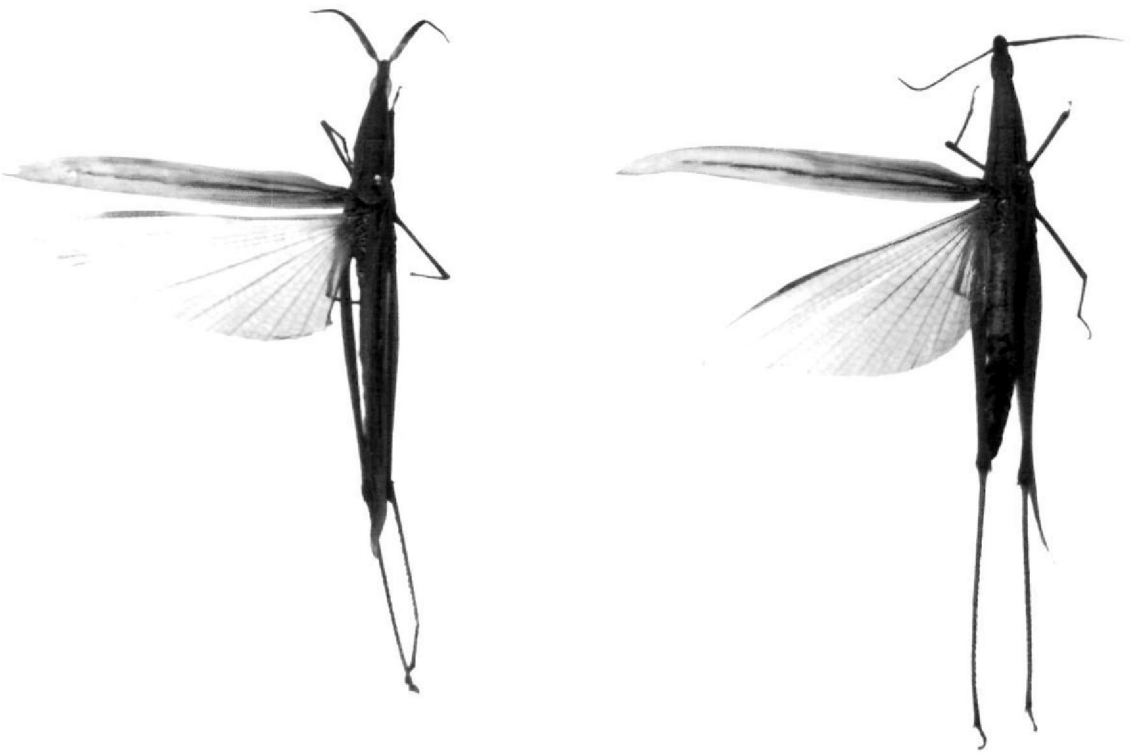
Fig. 6: *Aulacobothrus l. luteips*

Female

Fig. 7: *Leinotacris bolivari*

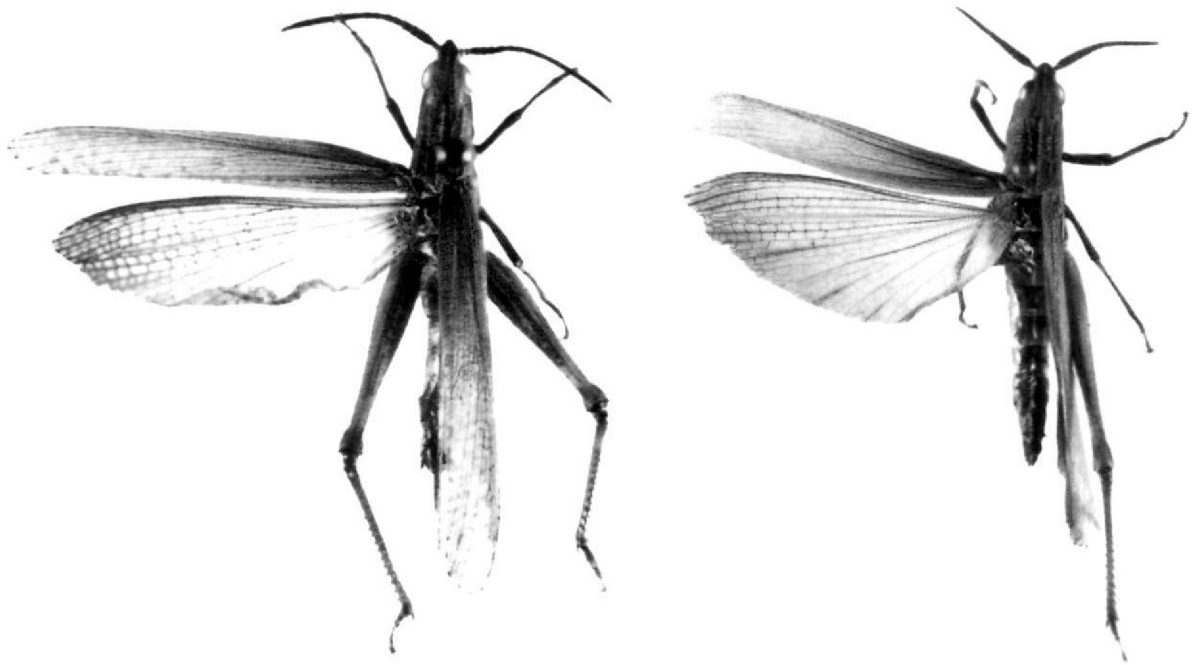
A). Male B). Female

Fig. 8: *Acrida exaltata*



A). Male B). Female

Fig. 9: *Acrida gigantea*



A). Male B). Female

Fig. 10: *Phlaeoba infumata*

A). Male B). Female

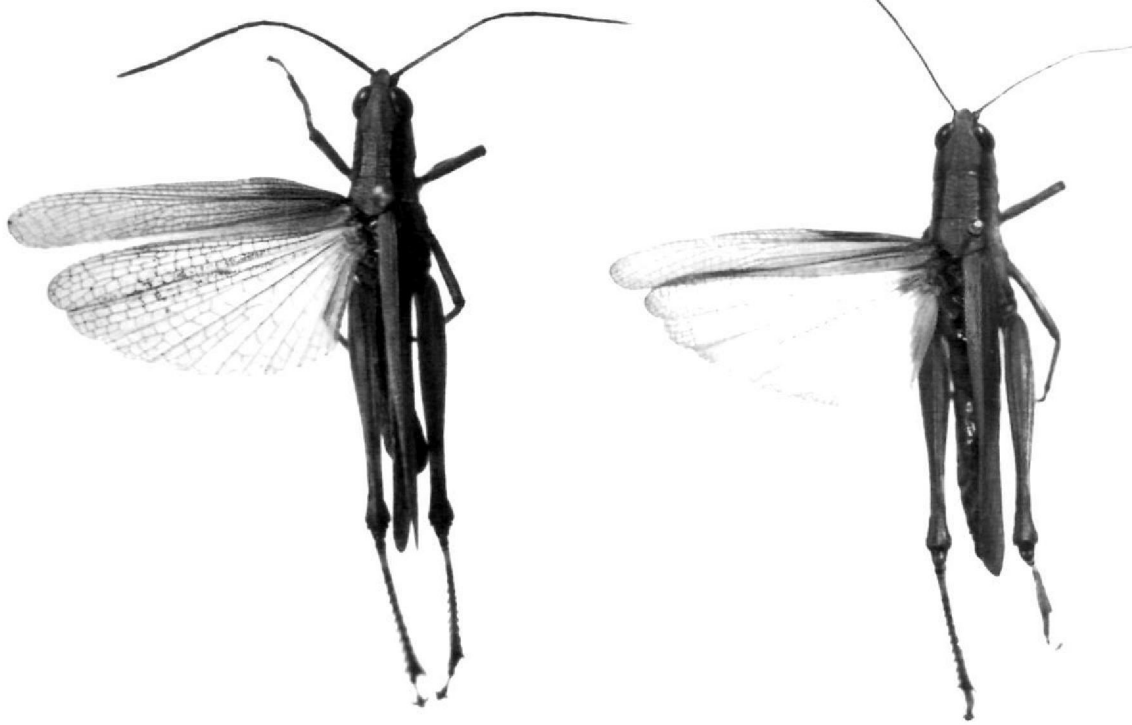
Fig. 11: *Phlaeoba panteli*

Male

Fig. 12: *Phlaeoba angustidorsis*

Female

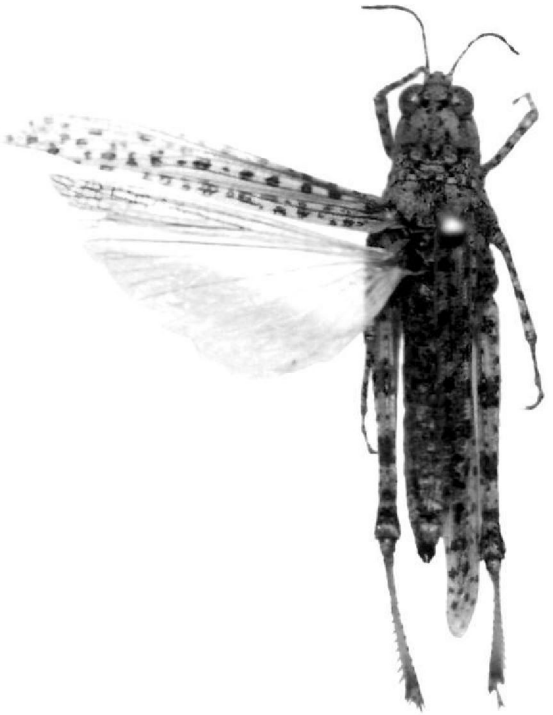
Fig. 13: *Phlaeoba tenebrosa*



A). Male

B). Female

Fig. 14: *Orthocta indica*



Female

Fig. 15: *Sphingonotus c. caerulans*

Female

Fig. 16: *Sphingonotus r. rubescens*

A). Male

B). Female

Fig. 17: *Trilophidia annulata*

Female

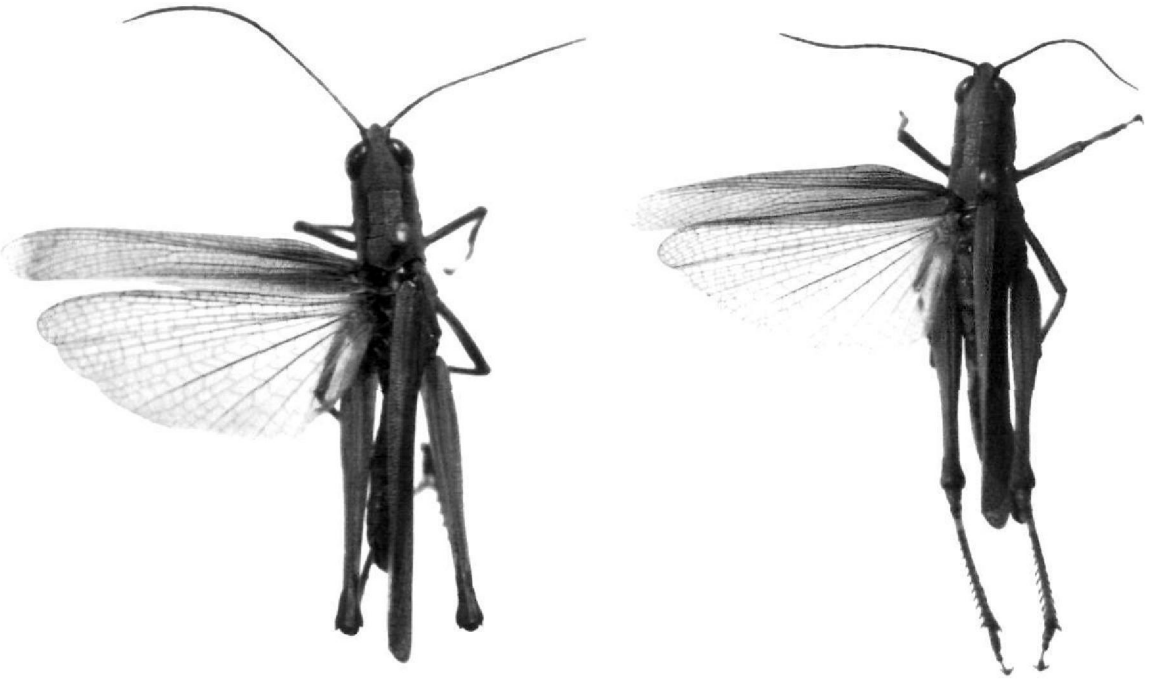
Male

Fig. 18: *Trilophidia repleta* Fig. 19: *Aiolpus thalassinus tamulus*

A). Male

B). Female

Fig. 20: *Aiolopus thalassinus thalassinus*



A). Male B). Female

Fig. 21: *Ceracris deflorata*

Female

Fig. 22: *Ceracris nigricornis*

Male

Fig. 23: *Chloebora marshalli*

A). Male B). Female

Fig. 24: *Heteropternis respondens*

A). Male B). Female

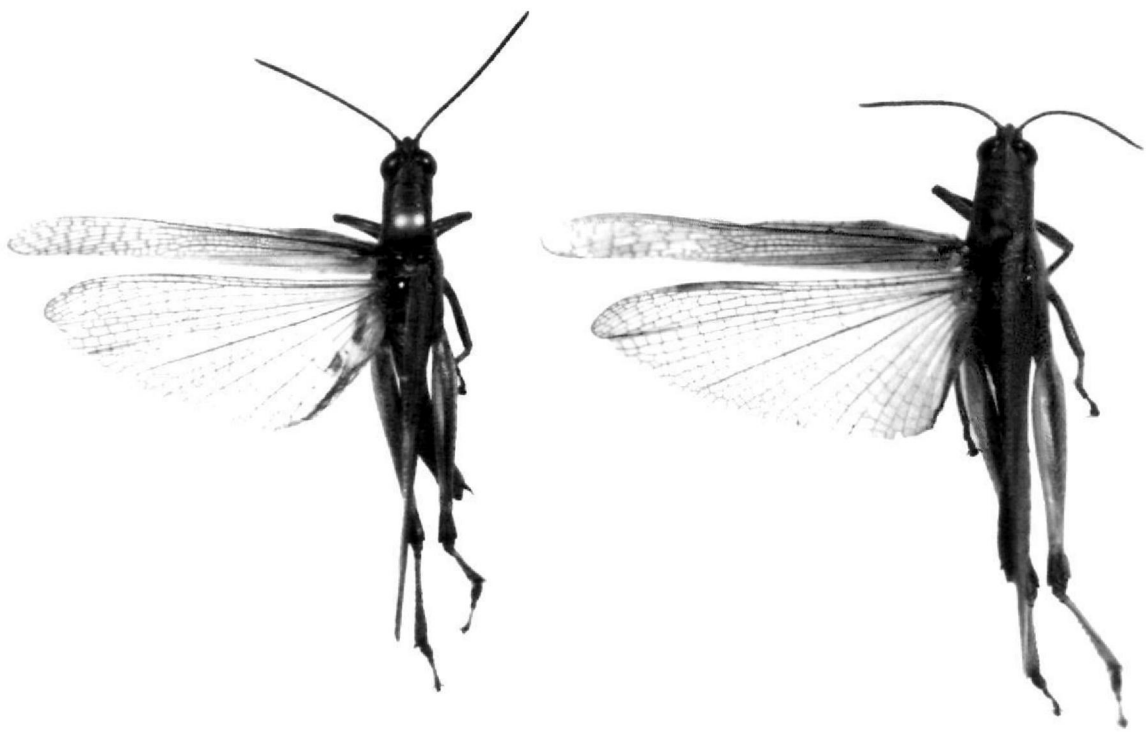
Fig. 25: *Dittopternis venusta*

Male

Fig. 26: *Scintharista notabilis*

Female

Fig. 27: *Oxya japonica vitticolis*



A). Male

B). Female

Fig. 28: *Gesonula punctifrons*

A). Male B). Female

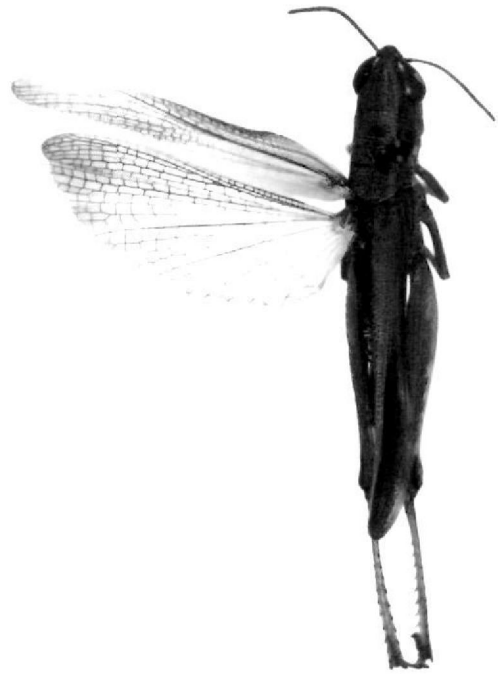
Fig. 29: *Oxya fuscovittata*

A). Male B). Female

Fig. 30: *Oxya velox*

Male

Fig. 31: *Oxya chinensis*



Female

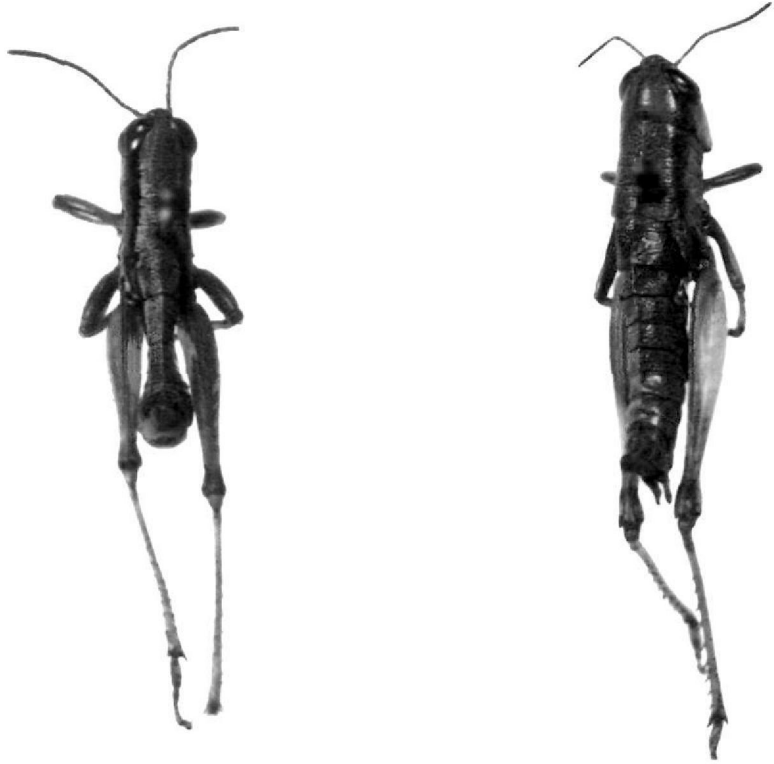
Fig. 32: *Oxya hyla hyla*

Female

Fig. 33: *Caryanda paravicina*

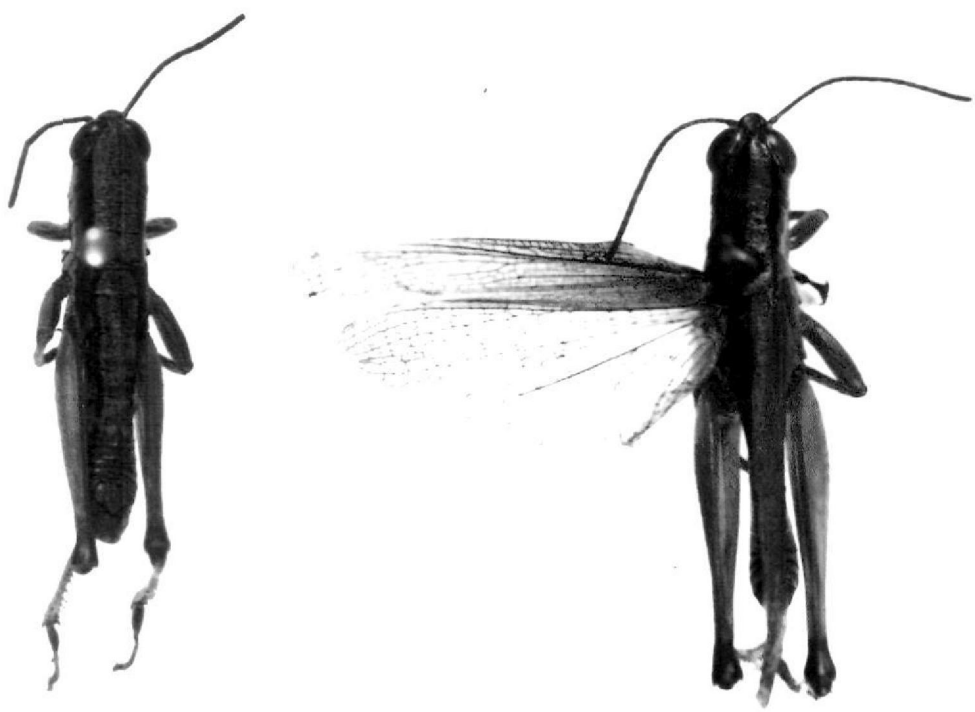
Female

Fig. 34: *Cercina mussoriensis*



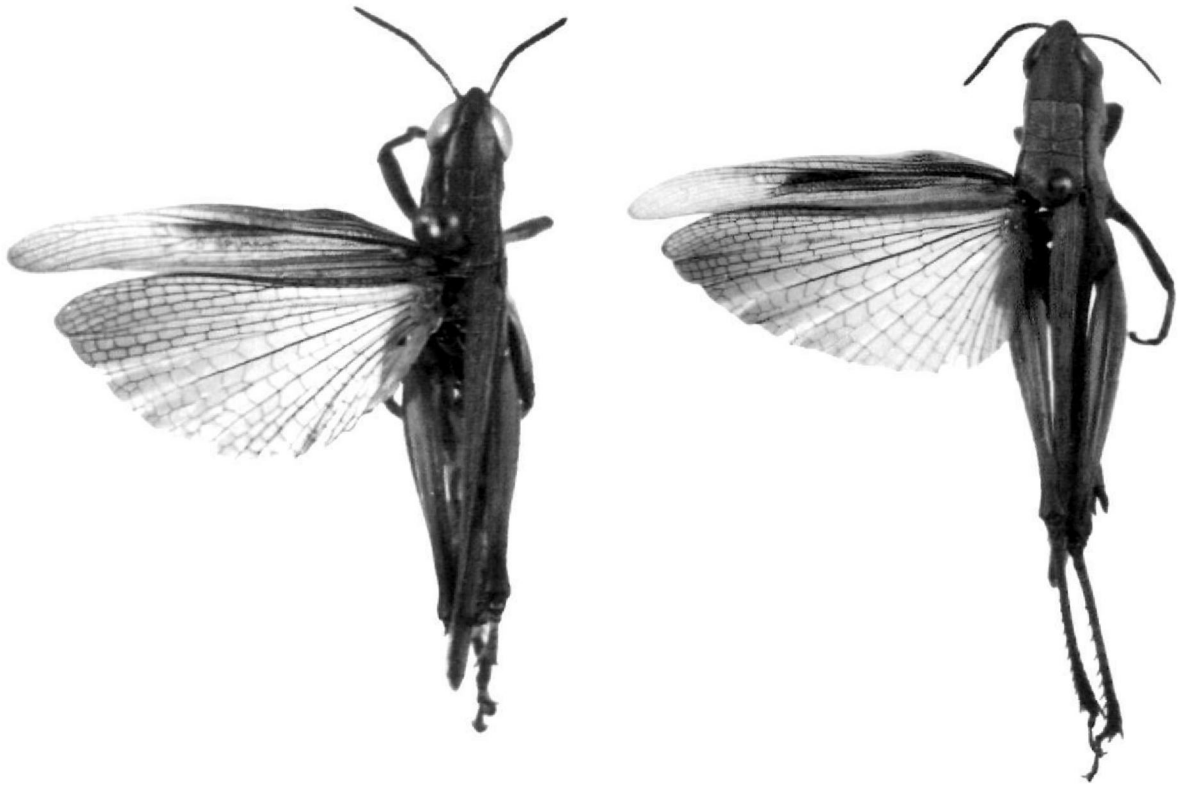
A). Male B). Female

Fig. 35: *Lemba motinagar*



Male Male

Fig. 36: *Lemba elongata sp.n.* Fig. 37: *Pseudoxya diminuta*



A). Male B). Female

Fig. 38: *Spathosternum p. prasinferum*

A). Male B). Female

Fig. 39: *Neooxyrrhepes meghalayensis* gen. n., sp. n.

A). Male B). Female

Fig. 40: *Oxyrrhepes obtusa*

Female

Fig. 41: *Tristria pulvinata*

Female

Fig. 42: *Chondracris rosea*

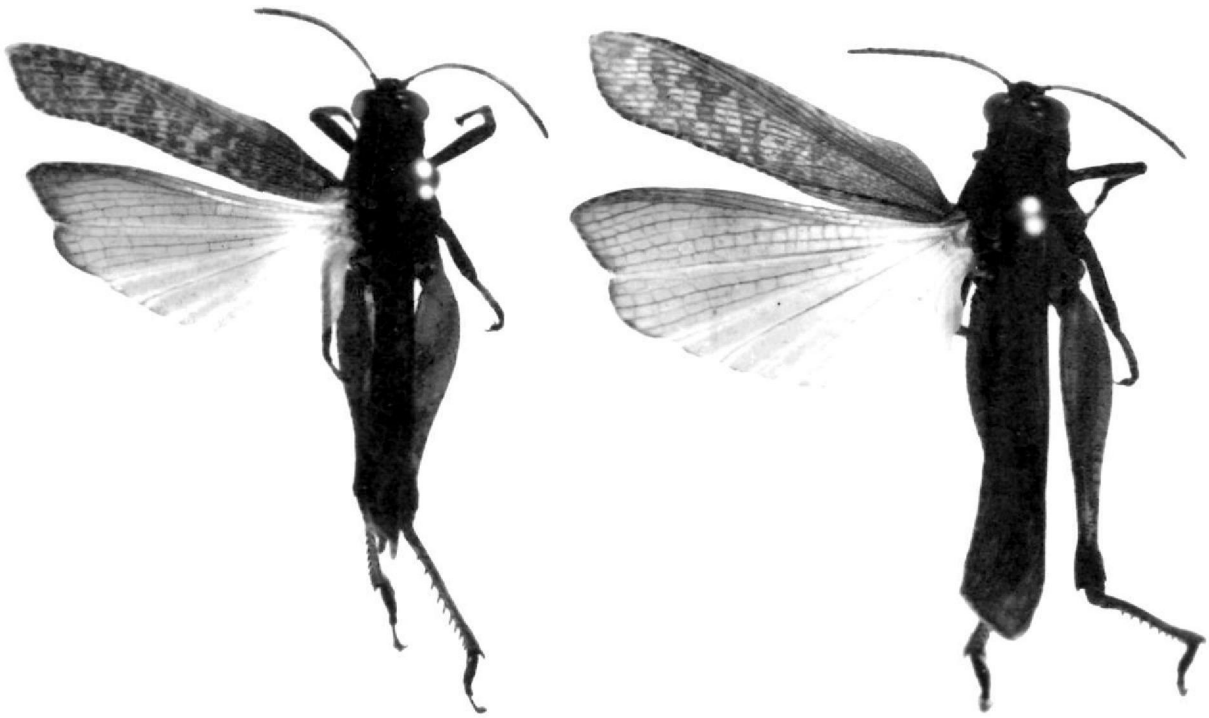
Female

Fig. 43: *Patanga succinata*

A). Male

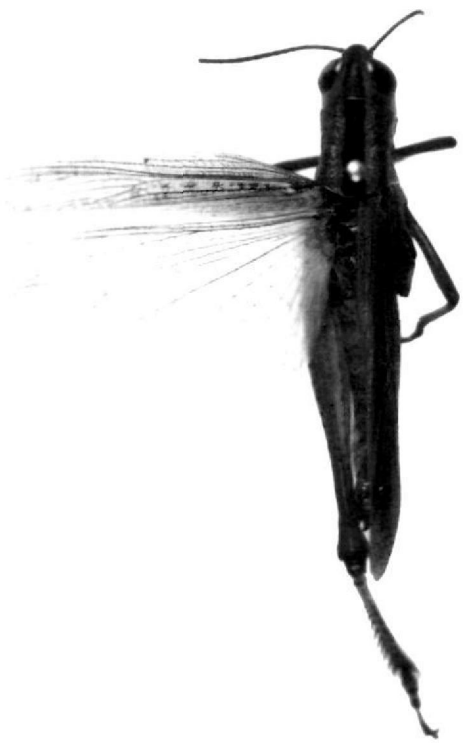
B). Female

Fig. 44: *Eucoptacra praemorsa*



A). Male B). Female

Fig. 45: *Epistauras aberrans*

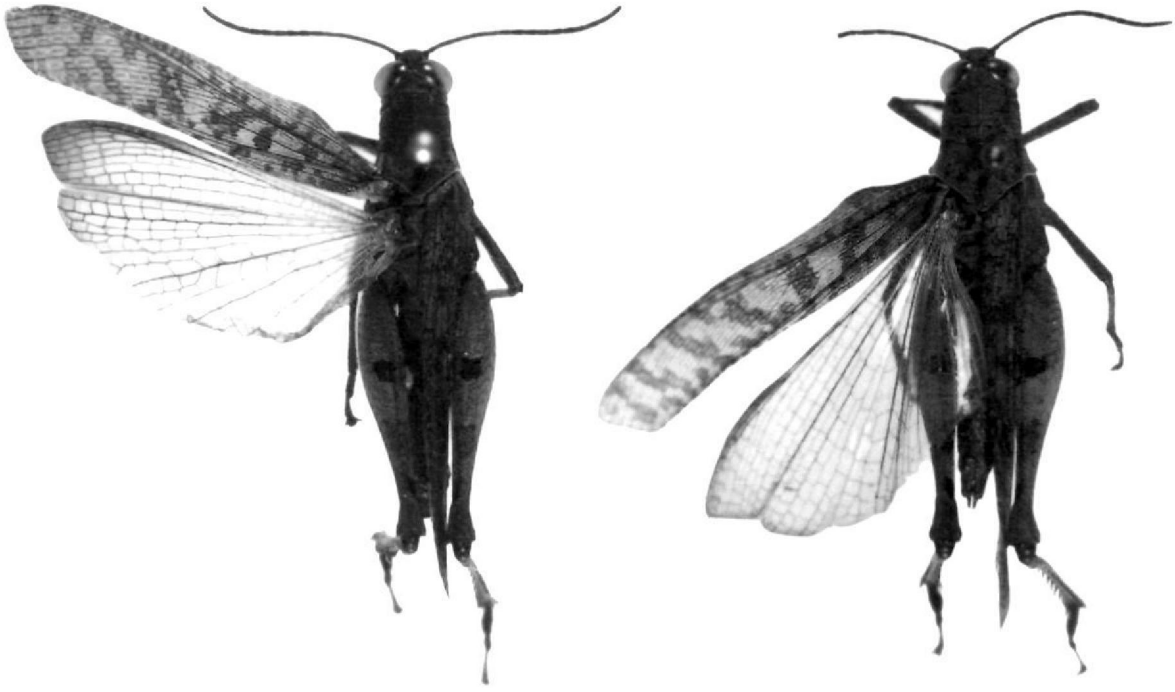


Female

Fig. 46: *Eyprepocnemis a. alacris*

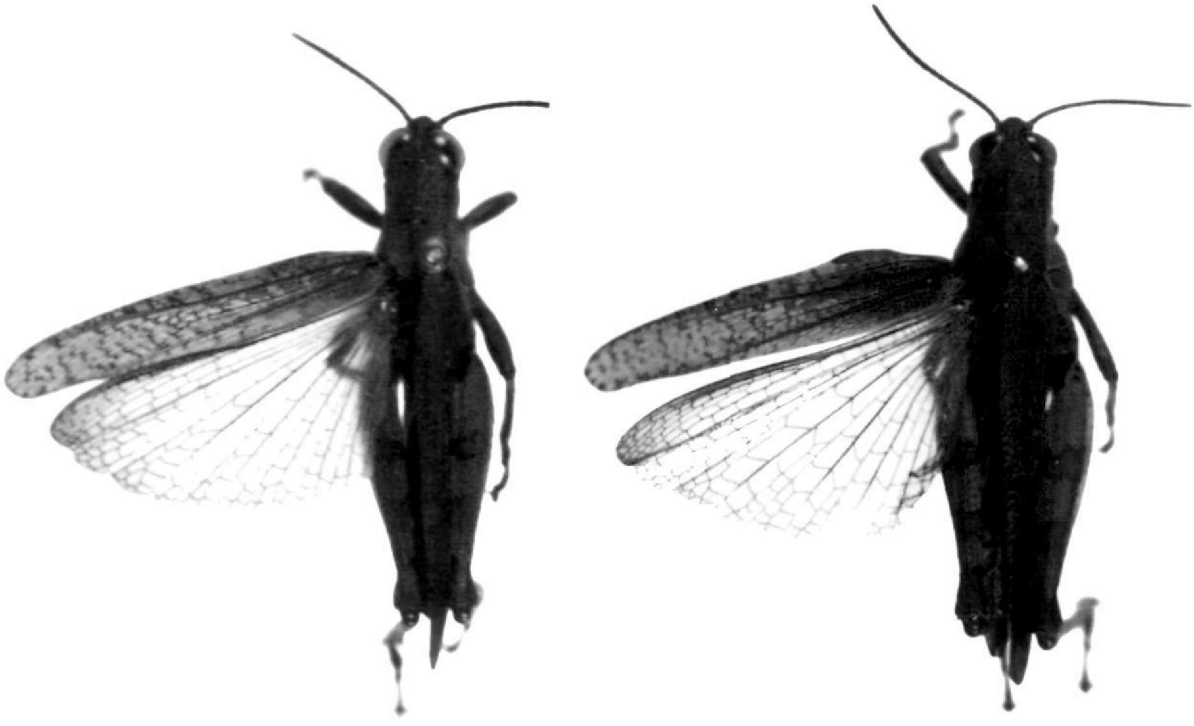
Female

Fig. 47: *Catantops erubescens*



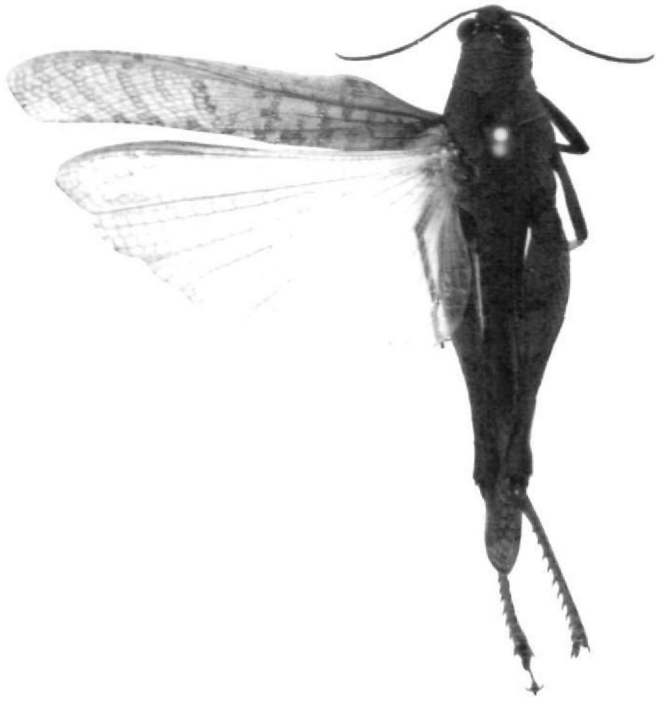
A). Male B). Female

Fig. 48: *Xenocatantops humilis*



A). Male B). Female

Fig. 49: *Xenocatantops karnyi*



Female

Fig. 50: *Xenocatantops brachycerus*

Female

Fig. 51: *Palniacris rugulosa*

A). Male

B). Female

Fig. 52: *Apalniacris shillong*

Female

Fig. 53: *Gerenia pustulipennis*

Female

Fig. 54: *Diabolocatantops consobrinus*

Female

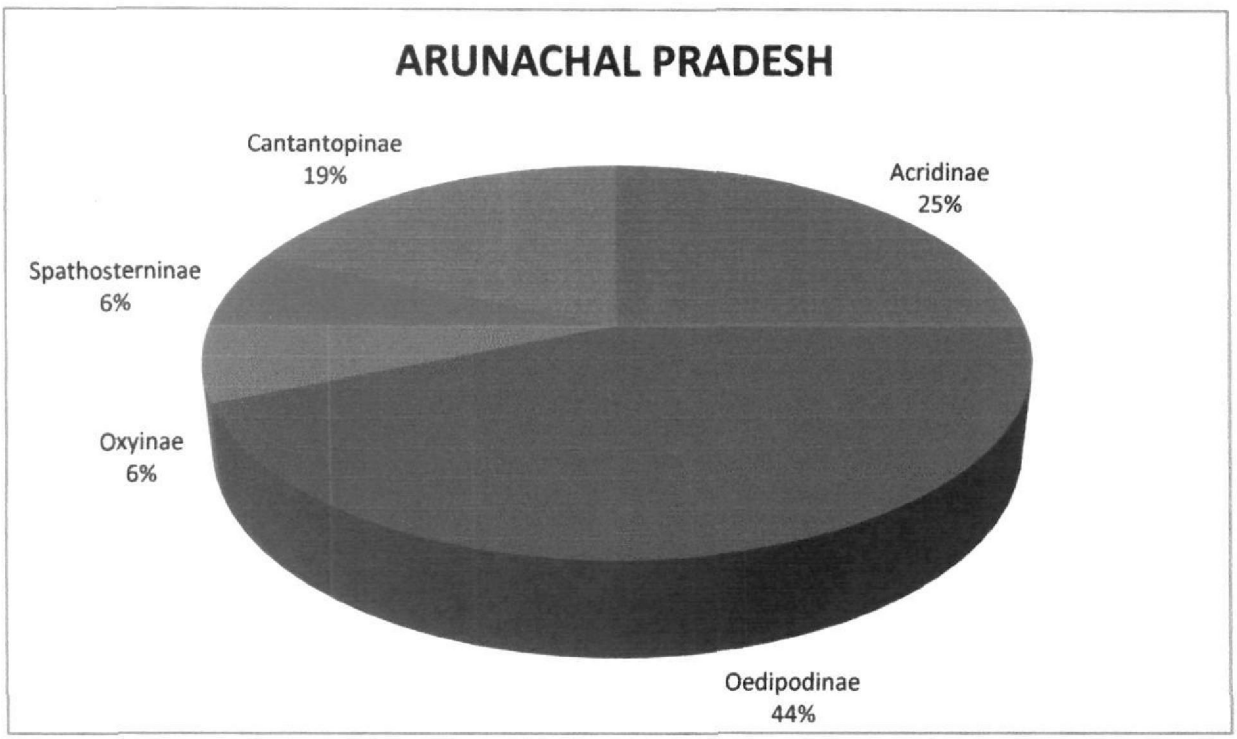
Fig. 55: *Stenocatantops splendens*

Female

Fig. 56: *Pachyacris violascens*

A). Male B). Female

Fig. 57: *Choreodocus robustus*



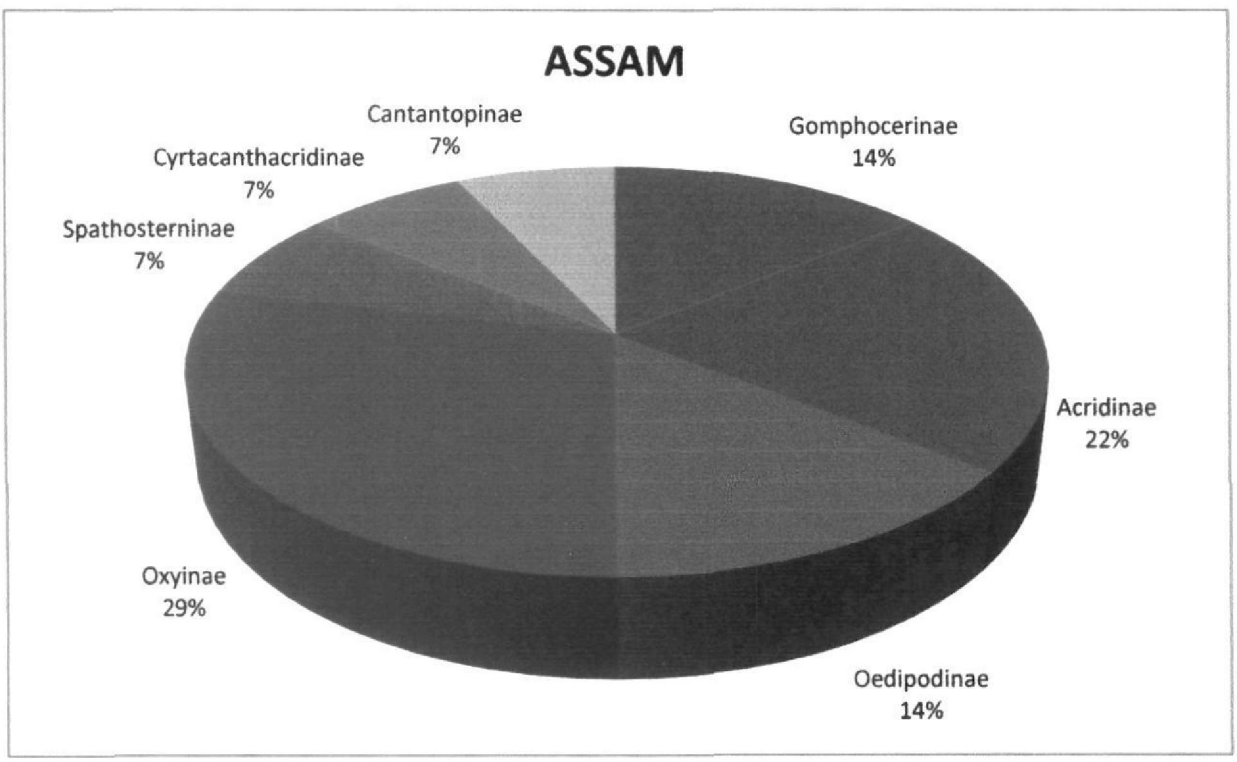
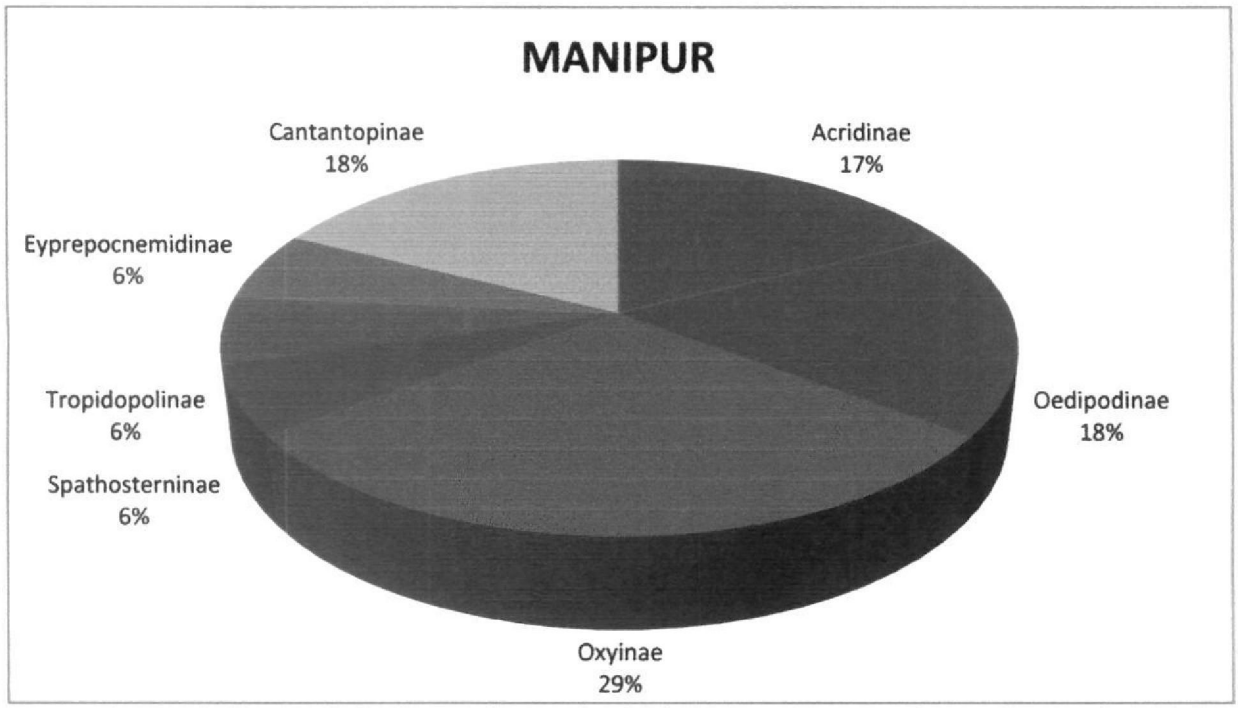


Fig. 58: Sub-familial diversity of Arunachal Pradesh and Assam based on number of genera recorded



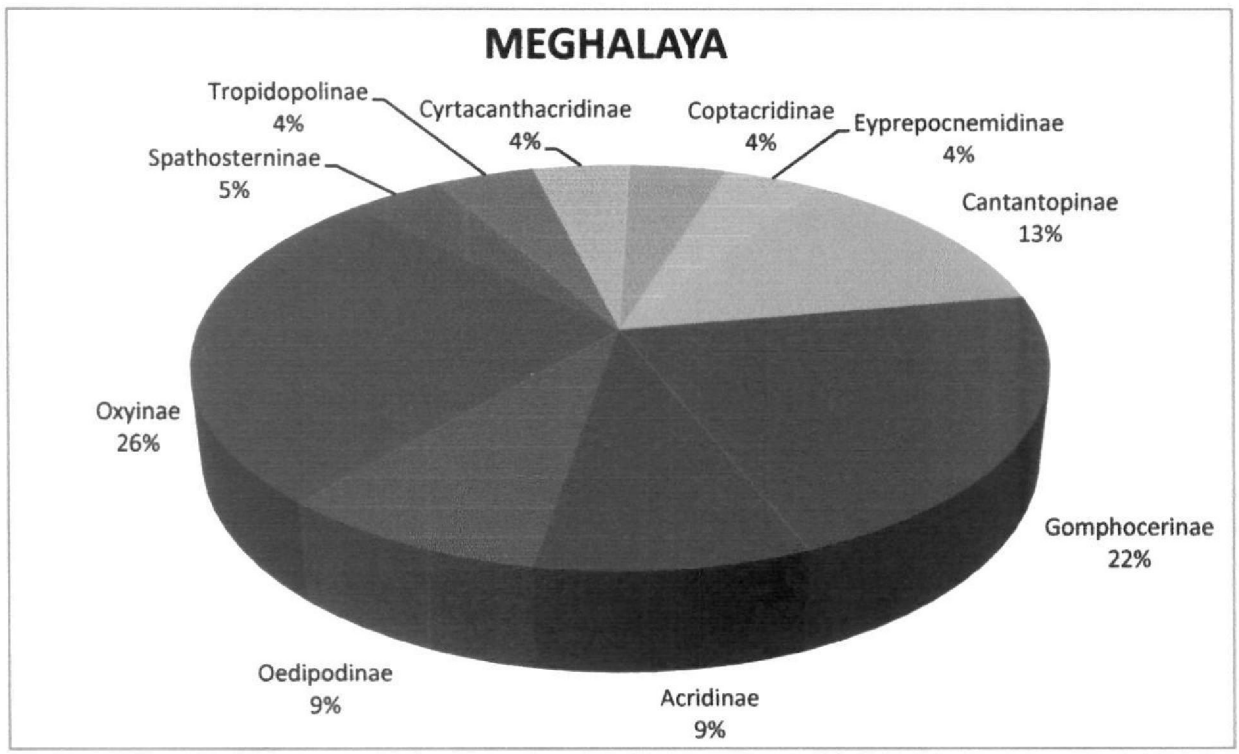
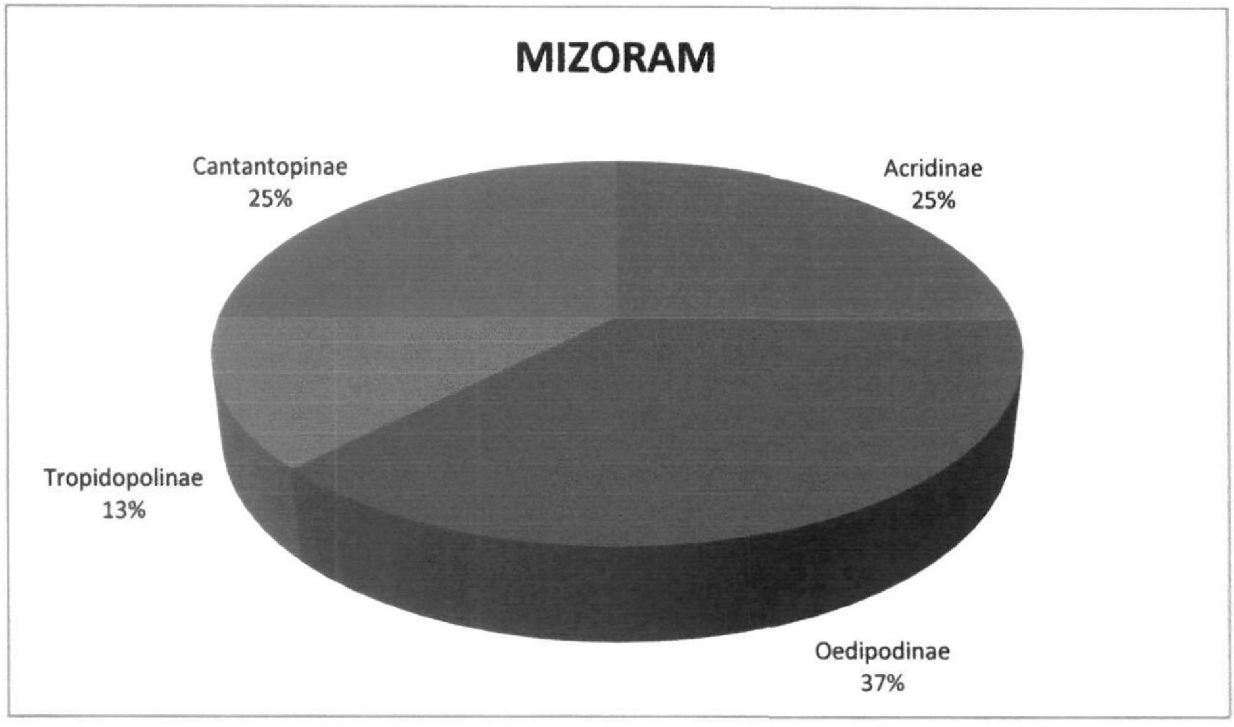


Fig. 59: Sub-familial diversity of Manipur and Meghalaya based on number of genera recorded



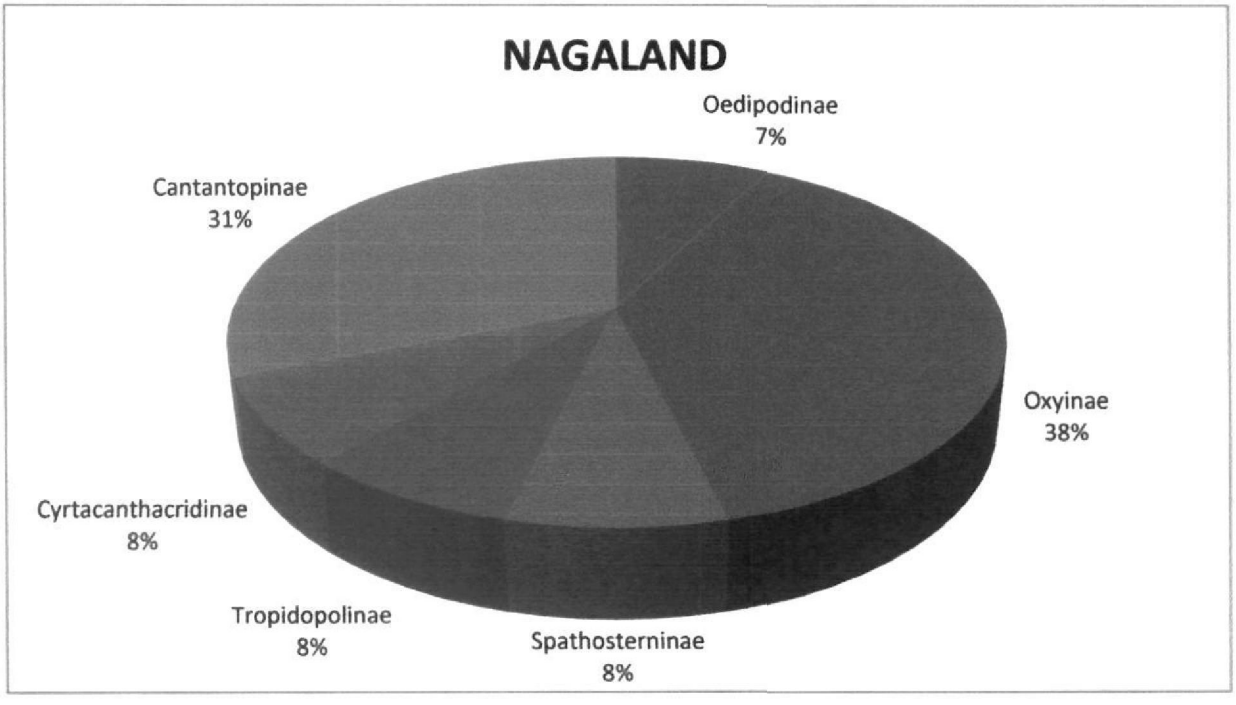
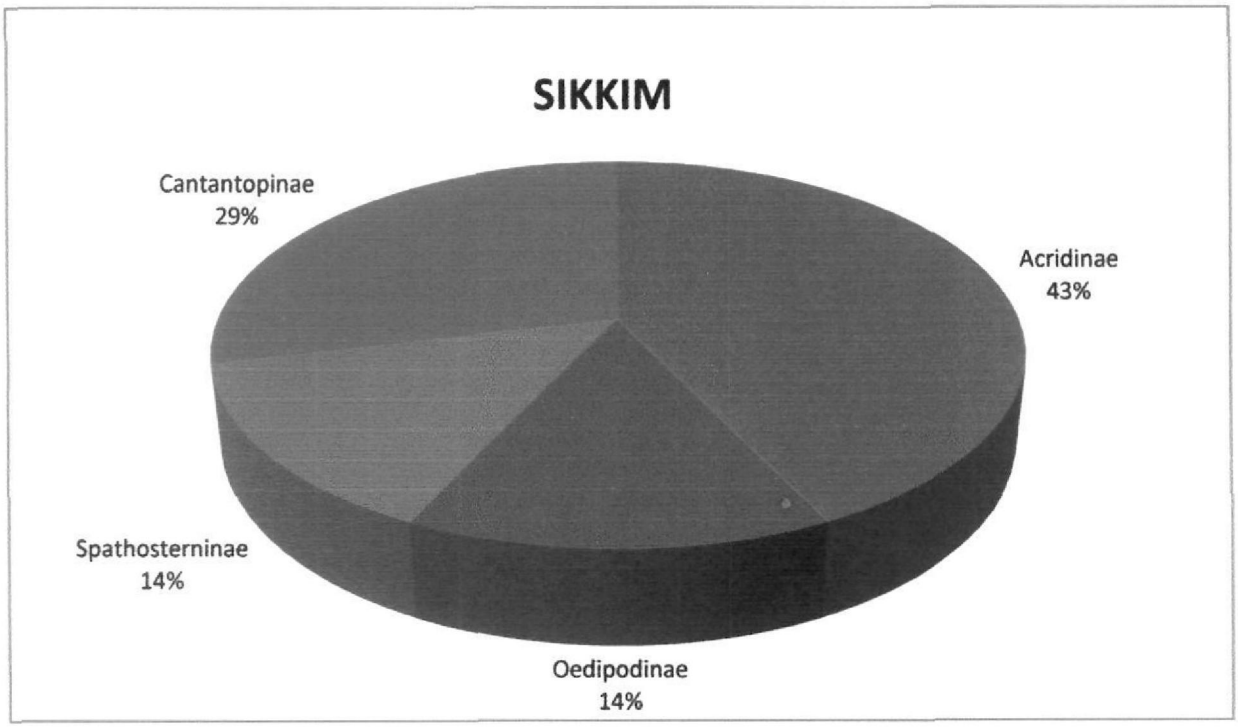


Fig. 60: Sub-familial diversity of Mizoram and Nagaland based on number of genera recorded.



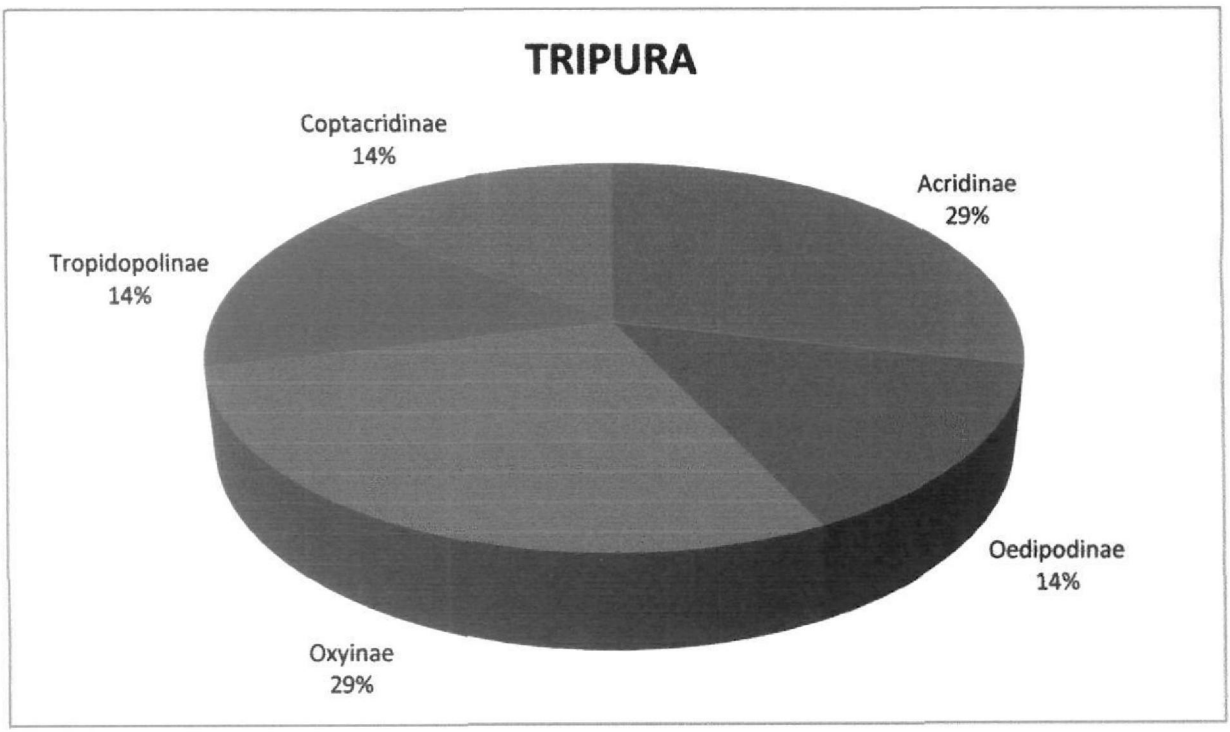


Fig. 61: Sub-familial diversity of Sikkim and Tripura based on number of genera recorded.

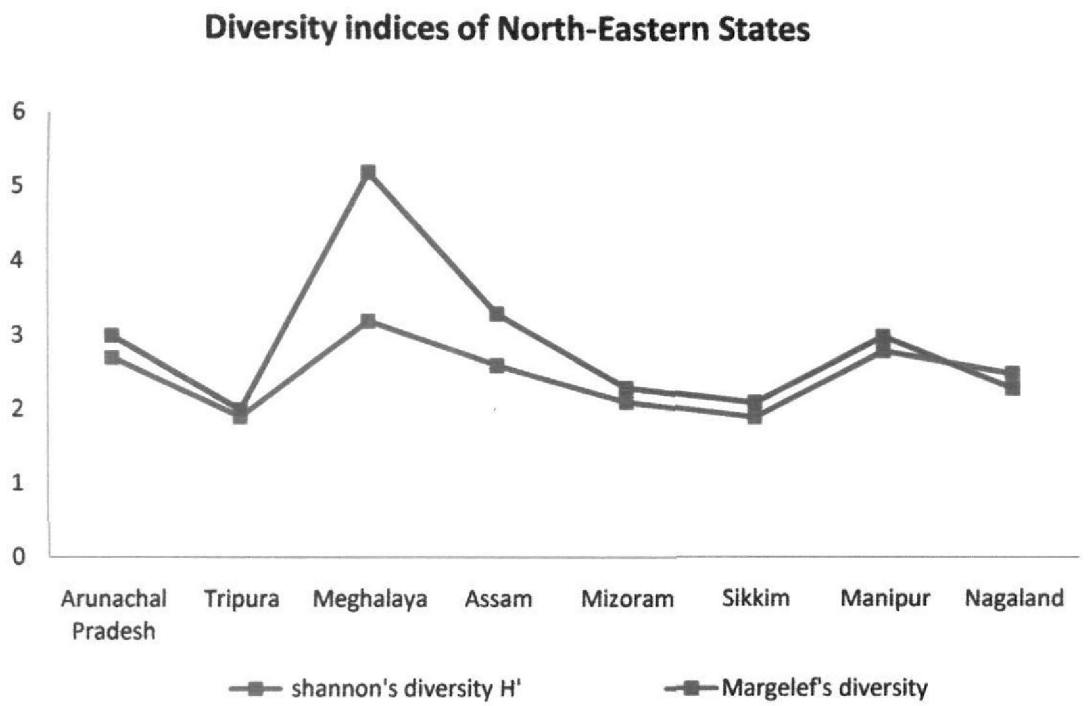


Fig. 62: Comparison between Shannon's diversiy and Margelef's diversity of all states.

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A Preliminary Check List of Locusts and Grasshoppers (Orthoptera:Acridoidea) of North East India

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ABSTRACT

The present study is based on the fresh material collected during the course of survey (2008-2009) from various regions in north-eastern states of India. This represents the first systematic collection of Acridoidea from this area. Distribution and host plant data are also given for the species. In the present work, 796 specimens of Acridoidea representing three families, twelve subfamilies, three tribes, thirty six genera and fifty three species were collected from this region.

Key words *Locust, Grass hopper, survey, Acridoidea*

A notable taxonomic work on Acrididae was made by Kirby, 1914. Hazra, *et al.*, 1995, Shishodia, *et. al.*, 2003 and Mandal, *et. al.*, 2006 reported few species of Acridids from Meghalaya, Sikkim and Arunachal Pradesh respectively. An extensive and intensive survey to study the speciation and distribution of the locusts and grasshoppers belonging to the superfamily Acridoidea was undertaken in north-eastern region during the period 2008-2009. Systematic study of the material collected from various habitats and localities was made to understand the diversity in the group.

Various important agricultural areas in different localities of this region were visited during 2008-2009 for survey of Acridoid pests of agricultural crops. The survey yielded a good number of specimens (796) from localities, which served as a basis for the present critical study. This is the first systematic collection of locusts and grasshoppers from North-eastern states. Further, it has revealed interesting observations on the distribution of grasshopper species in different regions. Some useful observations were also studied on their biology, pest-plant and plant-pest relationships.

MATERIALS AND METHODS

Fresh material (specimens) of adult grasshoppers of both sexes from various localities and regions of North-eastern states was brought to laboratory which served the basis for the present study. A complete record was also maintained indicating the reference number, locality, data of collection and name of host plants etc.

Various agricultural areas of north-eastern states were visited during the period 2008-2009 for the collection of grasshoppers and locusts. Attempts were made to collect the specimens from their host plants as well as those attracted to light during the night. Different parts of crops were examined. Attention was also given to fruits and vegetables. The collected specimens were killed in cyanide bottles.

Dry mounts were also prepared for better understanding of certain characters like size, colour, texture etc. For this purpose, the specimens were first relaxed, stretched and later, they were pinned and labelled. Permanent collections of pinned specimens were kept in store boxes and cabinets for further studies on their morphological structures.

For a detailed study of the various components of genitalia, the apical part of male and female bodies were cut off and boiled in 10% potassium hydroxide for a variable period till the material became transparent (usually about 10 minutes) to remove unsclerotized and non-chitinous tissues. They were then thoroughly washed in tap water for complete removal of KOH and examined in 70% ethyl alcohol on a cavity slide. Later, every specimen was dissected under a binocular microscope with the help of fine needles to separate various components *viz.*, supra-anal plate and cerci, subgenital plate, epiphallus and aedeagus of male, supra-anal plate and cerci, subgenital plate, ovipositor and spermatheca of female. The normal process of dehydration was adopted and clearing was done in clove oil. The genitalic structures were mounted separately on cavity slides in canada balsam. The ovipositor was mounted in canada balsam on another cavity slide oriented to the required position without cover glass. The slides were kept in a slide drier at a temperature of approximately 40°C for about one week to get them completely dry.

RESULTS AND DISCUSSION

In the present study the authors uphold recent workers in classiflying Acridoidea with a few generally accepted changes. The genera and species recorded from this region are assigned under the following families and subfamilies, mainly based on conventional as well as genitalic characters. Family Pyrgomorphidae: Subfamilies Atractomorphini, Chrotogonini, Tagastini: Family Catantopidae: Subfamilies Eyprepocnemidinae, Catantopinae, Oxyinae, Hemiacridinae, Tropidopolinae, Cyrtacanthacridinae, Coptacridinae; Family Acrididae: subfamilies Acridinae, Oedipodinae and Gomphocerinae.

Superfamily Acridoidea Latreille, 1802

Family Pyrgomorphidae Brunner, 1874

Type-genus: *Pyrgomorpha* Serville, 1838

Tribe Chrotogonini Bolivar, 1884

Bolivar, 1884 recognized Chrotogonae as subtribe. Jacobson and Bianki, 1905 raised it to subfamily Chrotogoninae. Kevan 1959 treated it as tribe Chrotogonini. Since then its status has been changing frequently as tribe, subtribe, section, group.

The tribe is represented by a two genera in this region.

Genus *Chrotogonus* Serville, 1839

The genus is represented by three species in this region.

1. *Chrotogonus trachypterus* (Blanchard)

Material examined: Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 4♀, 2♂.

Morphometry: Female: Body length: 8.9, Tegmina: 12.3, Pronotum: 5.3, Hind femur: 8.9

Male: Body length: 7.1, Tegmina: 9.1, Pronotum: 4.0, Hind femur: 7.1

2. *Chrotogonus oxypterus*

Material examined : Arunachal Pradesh, East Siang, Pasighat, 2-II-2009, on grasses, 7♀, 3♂. Tripura, Agartala, Lembucherra, 13-II-2009, on grasses, 7♀, 2♂.

Morphometry: Male: Bodylength 13.05, Tegmina 8.54, Pronotum 1.5, Hind femur 7.61

3. *Chrotogonus armatus*

Material examined: Tripura, Agartala, Lembucherra, 13-II-2009, on grasses, 3♀, 1♂.

Morphometry: Female: Body length: 20.9, Tegmina: 12.6, Pronotum: 5.3, Hind femur: 10.1

Male: Body length: 15.0, Tegmina: 7.2, Pronotum: 4.42, Hind femur: 8.3

Genus *Tenuitarsus* Bolivar

The genus is represented by a single species.

4. *Tenuitarsus orientalis* Kevan

Material examined: Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 3♀; 2-II-2009, on grasses, 7♀, 2♂.

Morphometry: Female: Body length: 19.48, Tegmina: 13.56, Pronotum: 1.85, Hind femur: 10.82

Male: Body length: 15.22, Tegmina: 12.50, Pronotum: 1.49, Hind femur: 9.92

TRIBE ATRACTOMORPHINI Bolivar, 1884

The tribe is known to contain a single genus *Atractomorpha* from India.

Genus *Atractomorpha* Saussure

The genus is represented by three species in this region.

5. *Atractomorpha himalayica* Bolivar

Material examined : Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 2♀, Shillong, Cadmawphlong, 23-X-2008, on grasses, 6♀, 2♂. Assam, Guwahati, Patorkuchi, 30-X-2008, on grasses, 8♀, Jowai, Murkongselek, 5-II-2009, on grasses, 4♀. Arunachal Pradesh, East Siang, Pasighat, 3-II-2009, on grasses, 7♀, 2♂. Mizoram, Aizwal, Selesih, 11-II-2009, on grasses, 7♀, 5♂.

Morphometry : Female: Body length 26.85, Tegmina 26.6, Pronotum 2.89, Hind femur 16.94

Male: Body length 17.36, Tegmina 17.83, Pronotum 1.89, Hind femur 10.18

6. *Atractomorpha sinensis* Bolivar

Material examined: Assam, Guwahati, Bongra, 28-X-2008, on paddy field, 5♀.

Morphometry: (length in mm)

Female: Body length 22.37, Tegmina 19.7, Pronotum 1.9, Hind femur 11.05

7. *Atractomorpha angusta* Karsch

Material examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 2♀.

Morphometry:

Female: Body length 27.98, Tegmina: 20.6, Pronotum: 3.09, Hind femur: 15.95

TRIBE TAGASTINI Bolivar, 1905

The tribe is known to contain a single genus *Tagasta* from India.

Genus *Tagasta* Bolivar

8. *Tagasta indica* Bolivar

Material examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 1♀.

Morphometry: (length in mm)

Female: Body length 37.38, Tegmina 22.3, Pronotum 4.1, Hind femur20.00

Family Catantopidae Brunner, 1893

Catantopidae Brunner, 1893: 144.

Type-genus: *Catantops* Schaum, 1853.

Subfamily Oxyinae Brunner, 1893

This subfamily is represented by four genera from this region.

Genus *Oxya* Serville

9. *Oxya fuscovittata* (Thunberg)

Material examined: Meghalaya, Jowai, Ummalong, 22-X-2008, on grasses, 3♀, Shillong, Ladmawphlong, 23-X-2008, on grasses, 2♀. Arunachal Pradesh, East Siang, Pasighat, 31-

I-2009, on grasses, 1♀. Mizoram, Aizwal, Selesih, 11-II-2009, on grasses, 5♀, 2♂.

Morphometry: (length in mm)

Female: Body length 25.0, Tegmina 20.05, Pronotum 1.75, Hind femur 15.84

Male: Body length 20.15, Tegmina 16.43, Pronotum 1.61, Hind femur 12.92.

10. *Oxya hyla hyla* Serville

Materaial examined: Assam, Jowai, Silchar, 17-II-2009, on grasses, 2♀ 2♂.

Morphometry: Female: Body length 26.5, Tegmina 23.0, Pronotum 6.4, Hind femur 17.6

11. *Oxya velox* (Fabricius)

Material examined: Tripura, Agartala, Mohanpur, 15-II-2009, on grasses, 3♀, 2♂.

Morphometry : Male: Body length 22.4, Pronotum 6.1, Tegmina 19.4, Hind femur 14.4.

Female: Body length 26.6, Pronotum 6.4, Tegmina 23.0, Hind femur 17.6.

Genus *Gesonula* Uvarov

12. *Gesonula punctifrons* (Stal)

Material examined: Assam, Guwahati, Bongra, 28-X-2008, on paddy field, 4♀, 2♂.

Morphometry: (length in mm)

Male: Body length 18.06, Tegmina 18.58, Pronotum 1.35, Hind femur 10.30.

Genus *Lemba* Huang, 1983

13. *Lemba* sp.n.

Material examined: Meghalaya, Shillong, Tyrsad, 24-X-2009, on grasses, 2B& .

Morphometry: (length in mm)

Male: Body length 15.32, Prtonotum 1.34, Hind femur 9.76

***Genus Cercina* Stal**

14. *Cercina* sp.n.

Material examined: Assam, Guwahati, Patorkuchi, 30-X-2008, on grasses, 2 B&.

Male: Body length: 15.75, Tegmina: Brachypterous, Pronotum: 1.37, Hind femur: 10.3

Subfamily Hemiacridinae Dirsh, 1956

The subfamily is represented by single genus in this region.

Genus *Spathosternum* Krauss

15. *Spathosternum prasiniferum* (Walker)

Material examined : Sikkim, Gangtok, Ranka, 14-X-2008, on grasses, 6♀, 2♂.Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 4♀, Shillong, Cherrapunji, 23-X-2008, on grasses, 5♀, 1♂. Assam, Guwahati, Patorkuchi, 23-X-2008, on grasses, 2♂. Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 9♀, 4♂.

Morphometry: (length in mm)

Female: Body length 21.5, Tegmina 15.2, Pronotum 1.45, Hind femur 11.98

Male: Body length 14.77, Tegmina 13.15, Pronotum 0.89, Hind femur 9.39

Subfamily Catantopinae Brunner, 1893

The subfamily is represented by a four genera in this region.

Genus *Catantops* Schaum 1853

The genus is represented by five species from this region.

16. *Catantops pinguis innotabilis* (Walker)

Material examined: Tripura, Agartala, Lembuchhera, 13-II-2009, on grasses, 2♂ 1♀.

Morphometry: (length in mm)

Male: Body 26.2, Antennae 9.5, Pronotum 6.1, Hind tibia 12.2

Female: Body length 32.0, Antennae 10.2, Pronotum 8.3, Tegmen 30.7, Hind femur 10.0, Tibia 15.7

17. *Catantops rubescens* (Walker)

Material examined: Arunachal Pradesh, East Siang, Pasighat, 3-II-2009, on grasses, 9♀.

Morphometry: (length in mm)

Female: Body length 22.46, Tegmina 23.65, Pronotum 1.42, Hind femur 16.19

18. *Catantops karnyi* Kirby

Material examined: Sikkim, Gangtok, Sichey, 14-X-2008, on grasses, 8♀, 3♂. Assam, Guwahati, Patorkuchi, 30-X-2008, on grasses, 4♀.Arunachal Pradesh, East Siang, Pasighat, on grasses, 5♀, 2♂.

Morphometry:

Female: Body length: 26.00, Tegmina: 20.75, Pronotum: 2.05, Hind femur: 15.2

Male: Body length: 20.05, Tegmina: 17.81, Pronotum: 1.66, Hind femur: 12.6

19. *Catantops consobrinus* karny

Material examined : Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 2♀. Mizoram, Aizwal, Selesih, 8-II-2009, on grasses, 9♀.

Morphometry: Female: Body length: 38.53, Tegmina: 36.91, Pronotum: 2.81, Hind femur: 21.17

20. *Catantops pulchellus* (Walker)

Material examined: Sikkim, Gangtok, Sichey, 14-X-2008, on grasses, 9♀, 2♂, Ranka, 14-X-2008, on grasses, 2♀.

Morphometry: Female: Body length 36.01, Tegmina 35.76, Pronotum 2.73, Hind femur 19.1

Male: Body length 27.2, Tegmina 26.51, Pronotum 2.0, Hind femur 15.22

Genus Xenocatantops Dirsh

21. *Xenocatantops humilis brachycerus* (Willemse)

Material examined: Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 1♀.

Morphometry: (length in mm)

Female: Body length 22.35, Tegmina 23.22, Pronotum 1.63, Hind femur 15.14

Xenocatantops humilis humilis (Serville)

Material examined: Mizoram, Aizwal, Selesih, 9-II-2009, on grasses, 7♀; 10-II-2009, on grasses, 9♀, 4♂.

Morphometry: (length in mm)

Male: Body length 20.65, Tegmina 20.0, Pronotum 1.5, Hind femur 13.68.

Female: Body length 24.2, Tegmina 25.1, Pronotum 2.0, Hind femur 17.63

Genus *Apalniacris* Sigfrid, Willemse, Shishodia 2004

22. *Apalniacris shillong* Sigfrid, Willemse, Shishodia 2004

Material examined: Meghalaya, Shillong, Ladmawphlong, 23-X-2008, on grasses, 2♀, 1♂; Tyrsad, 24-X-2009, on grasses, 1♀.

Morphometry: (length in mm)

Male: Body length 19.05, Tegmina Brachycerus, Pronotum 1.87, Hind femur 10.15

Female: Body length 22.23, Tegmina Brachycerus, Pronotum 2.72, Hind femur 14.41

Genus *Gerenia* Stal

23. *Gerenia postulipennis* (Walker)

Material examined: Assam, Guwahati, Bongra, 28-X-2008, on paddy field, 4♀.

Morphometry: Female: Body length 21.76, Pronotum 1.8, Hind femur 12.99

Subfamily Cyrtacanthacridinae Uvarov, 1923

Ditribution: South Palearctic, Ethiopian, Oriental and Australian region.

The subfamily is represented by two genera in this region.

Genus *Chondracris* Uvarov

24. *Chondracris rosea* (De Geer)

Material examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 1♂ 1♀.

Morphometry: (length in mm)

Female: Body length 80.66, Tegmina 73.79, Pronotum 9.2, Hind femur 49.45

Genus *Pachyacris* Uvarov

25. *Pachyacris violescens* (Walker) (Fig. 13 G-L)

Material examined : Mizoram, Aizwal, Selesih, 8-II-2009, on grasses, 4♀.

Morphometry: (length in mm)

Female: Body length 44.94, Tegmina 48.11, Pronotum 4.15, Hind femur 27.71

Subfamily Eyprepocnemidinae Brunner, 1893

Ditribution: South Palearctic, Ethiopian, Oriental and Australian region.

The subfamily Eyprepocnemidinae is represented by three genera in this region

Genus *Eyprepocnemis* Fieber, 1853

26. *Eyprepocnemis alacris* (Serville)

Material examined: Meghalaya, Shillong, Lumdaitkhla, 25-X-2008, on grasses, 7♀.

Morphometry: (length in mm)

Female: Body length 33.72, Tegmina 26.93, Pronotum 2.61, Hind femur 22.79

Genus *Choroedocus* I. Bolivar, 1914

27. *Choroedocus robustus* (Serville)

Material examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 4♀, 2♂.

Morphometry: (length in mm)

Female: Body length 66.89, Tegmina 57.7, Pronotum 4.15, Hind femur 45.56

Male: Body length 42.19, Tegmina 39.46, Pronotum 3.89, Hind femur 28.41

Genus *Navasia* Kirby

28. *Navasia insularis* Kirby

Material examined: Tripura, Agartala, Lambuchhera, 13.II.2009, on grasses, 1♀.

Morphometry : Female: Body 18, Tegmina: 14.56, Pronotum 3.5, Hind femur 9.5.

Subfamily Tropidopolinae Jacobson, 1902

The subfamily is represented by two genera in this region.

Genus *Oxyrrhepes* Stal

29. *Oxyrrhepes obtuse* var. *quadripunctata* Willemse

Material examined: Mizoram, Aizawal, Selesih, 09-II-2009, on grasses, 4♀; 10-II-2009, on grasses, 22♀, 12♂.

Morphometry: (length in mm)

Male: Body length 37.65, Tegmina 34.17, Pronotum 2.5, Hind femur 19.48

Female: Body length 48.87, Tegmina 46.68, Pronotum 3.24, Hind femur 27.23

Genus *Tristria* Stal

30. *Tristria pulvinata* (Uvarov)

Material examined: Tripura, Agartala, Lembuchhera, 13-II-2009, on grasses, 1♂.

Morphometry : Male: Body length 18, Pronotum 3.5, Hind femur 9.5.

Subfamily Coptacridinae Brunner, 1893

The subfamily is represented by two genera from the region.

Genus *Eucoptacra* I. Bolivar

31. *Eucoptacra praemorsa* (Stal)

Material examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 2♀. Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 1♀.

Morphometry: (length in mm)

Male: Body length 23.16, Tegmina 20.01, Pronotum 1.75, Hind femur 13.77

Female: Body length 18.32, Tegmina 19.71, Pronotum 1.35, Hind femur 13.69

Genus *Epistaurus* I. Bolivar

32. *Epistaurus aberrans* Brunner

Material examined: Tripura, Agartala, Lembuchhera, 13-II-2009, on grasses, 1♀, 1♂.

Morphometry:

Male: Body length: 7.04, Tegmina: 8.45, Pronotum: 4.86, Hind femur: 10.9

Female: Body length: 20.01, Tegmina: 10.1, Pronotum: 5.87, Hind femur: 12.23

Family Acrididae Latreille, 1802

Acrididae Latreille, 1802: 280.

Type-genus: *Acrida* Linnaeus, 1758.

The family Acrididae is represented by three subfamilies.

Subfamily Acridinae Latreille, 1802

Distribution: Palearctic region, Ethiopian, Madagascar, Oriental, Austro-oriental and Australian region.

The subfamily is represented by four genera.

Genus *Acrida* Linnaeus 1751.

33. *Acrida exaltata* (Walker)

Material examined: Assam, Guwahati, Sansari, 29-X-2008, on paddy field, 4♀, 2♂. Arunachal Pradesh, East Siang, Pasighat, 2-II-2009, on grasses, 7♀, 2♂, 3-II-2009, on grasses, 2♀.

Morphometry: (length in mm)

Female: Body length 49.89, Tegmina 45.48, Pronotum 2.56, Hind femur 31.74

Male: Body length 32.17, Tegmina 26.21, Pronotum 1.41, Hind femur 19.79

Genus *Phlaeoba* Stal

34. *Phlaeoba infumata* Brunner von Wattenwyl, 1893

Material examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 9♀, 2♂, Jowai, Ummalong, 22-X-2008, on grasses, 7♀, 3♂. Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 15♀, 5♂, 1-II-2009, on grasses, 10♀, 3♂. Mizoram, Aizwal, Selesih, 11-II-2009, on grasses, 5♀, 2♂. Tripura, Agartala, Lembucherra, 13-II-2009, on grasses, 15♀, 5♂.

Morphometry: (length in mm)

Female: Body length 26.5, Tegmina 22.7, Pronotum 2.44, Hind femur 16.95

Male: Body length 20.89, Tegmina 16.4, Pronotum 1.98, Hind femur 13.15

35. *Phlaeoba panteli* Bolivar

Material examined: Sikkim, Gangtok, Ranka, 14-X-2008, on grasses, 3♀. Meghalaya, Rai Bhoi, Umaran, 25-X-2008, on grasses, 6♀, 21-X-2008, on grasses, 4♀. Tripura, Agartala, Kamalghat, 14-II-2009, on grasses, 7♀, 2♂.

Morphometry: (length in mm)

Female: Body length 33.39, Tegmina 19.19, Pronotum 2.70, Hind femur 19.22

Genus *Orthochtha* Karsch

36. *Orthochtha indica* Uvarov

Material examined: Sikkim, Gangtok, Sichey, 14-X-2008, on grasses, 3♀, 2♂. Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 5♀, 2♂. Mizoram, Aizwal, Sihphir, 10-II-2009, on grasses, 7♀, 5♂.

Morphometry: (length in mm)

Female: Body length 35.5, Tegmina 26.5, Pronotum 2.2, Hind femur 21.65

Male: Body length 23.9, Tegmina 20.64, Pronotum 1.84, Hind femur 16.14

Genus *Ceracris* Walker

37. *Ceracris nigricornis* Walker

Material examined: Meghalaya, Shillong, Lumdaitkhla, 25-X-2008, on grasses, 2♀.

Morphometry: (length in mm)

Female: Body length 36.72, Tegmina 27.1, Pronotum 2.41, Hind femur 20.18

Subfamily Gomphocerinae Jacobson & Blanki, 1902

Comments: Dirsh, 1965 placed the Gomphocerine genera under the subfamily Truxalinae. Uvarov, 1966 divided the Truxalinae of Dirsh, 1965 into two groups: Gomphocerinae in which the stridulatory file consists of a series of peg hairs, and Truxalinae in which the file consists of unmodified hairs lying between peg-like cuticular expansion.

Rehn and Grant, 1960 attacked subfamily criteria of Uvarov. They were of the opinion that heavy emphasis on stridulatory mechanism was unjustified. Jago, 1969, 1971 followed Uvarov, 1966 and used the name and subfamily rank Gomphocerinae. Harz, 1975, Dirsh, 1975 and other recent workers also treated Gomphocerinae as subfamily of Acrididae.

Gomphocerinae is treated here as subfamily of Acrididae. The subfamily is represented by five genera.

Genus *Aulacobothrus* I. Bolivar

38. *Aulacobothrus strictus* (I. Bolivar)

Material examined: Meghalaya, Rai Bhoi, Thaldskin, 22-X-2008, on grasses, 2♀.

Morphometry: (length in mm)

Female: Body length 21.25, Tegmina 12.94, Pronotum 1.5, Hind femur 13.64

39. *Aulacobothrus bolivari* (Uvarov)

Material examined: Meghalaya, Rai Bhoi, Thaldskin, 22-X-2008, on grasses, 6♀.

Morphometry: (length in mm)

Female: Body length 20.48, Tegmina 13.18, Pronotum 1.57, Hind femur 13.87

40. *Aulacobothrus decisus* (Walker)

Material examined: Meghalaya, Rai Bhoi, Thaldskin, 22-X-2008, on grasses, 1♀.

Morphometry: Female: Body length: 22.15, Tegmina: 17.56, Pronotum: 5.23, Hind femur: 14.85

41. *Aulacobothrus luteips* (Walker)

Material examined: Meghalaya, Rai Bhoi, Thaldskin, 22-X-2008, on grasses, 1♂.

Morphometry: (length in mm)

Male: Body length 10.8, Pronotum 5.7, Tegmina 15.1, Hind femur 10.7

Genus *Leva* I. Bolivar

42. *Leva indica* (I. Bolivar, 1902)

Material examined: Meghalaya, Shillong, Cherapunji, 23-X-2008, on grasses, 1B& 2♀.

Morphometry: (length in mm)

Male: Body length 15.2-15.0, Pronotum 7.3-7.5, Tegmina 14.0-14.9, Hind femur 10.1-10.5

Female: Body length 17.4-17.6, Pronotum 8.9-9.1, Tegmina 19.8-20.1, Hind femur 11.9-12.1

43. *Leva apicalis* (Walker)

Material examined : Meghalaya, Shillong, Cherapunji, 23-X-2008, on grasses, 1B&.

Morphometry:

Male: Body length 15.25, Tegmina 9.94, Pronotum 1.0, Hind femur 9.85

Genus *Chorthippus* Fieber 1852

44. *Chorthippus indus* Uvarov

Material examined : Meghalaya, Rai Bhoi, Thaldskin, 22-X-2008, on grasses, 4♀, 2♂.

Morphometry: (length in mm)

Female: Body length 20.68, Tegmina 12.56, Pronotum 1.89, Hind femur 13.56

Male: Body length 14.41, Tegmina 9.1, Pronotum 1.23, Hind femur 9.7

Subfamily Oedipodinae Scudder, 1875

Distribution: The subfamily is distributed in all zoogeographical regions.

The subfamily Oedipodinae is represented by seven genera.

Genus *Trilophidia* Stal

45. *Trilophidia annulata* (Thunberg, 1815)

Material examined: Meghalaya, Rai Bhoi, Umran, 21-X-2008, on grasses, 3♀. Assam, Guwahati, Sansari, 29-X-2008, on grasses, 4♀, 1B&. Assam, Guwahati, Amingaon, 29-X-2008, on grasses, 5♀, 2♂. Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 7♀, 3♂, 2-II-2009, on grasses, 8♀, 5♂, 4-II-2009, on grasses, 4♀. Mizoram, Aizwal, Selesih, 8-II-2009, on grasses, 7♀, 3♂., 11-II-2009, on grasses, 4♀.

Morphometry: (length in mm)

Female: Body length 21.5, Tegmina 21.15, Pronotum 1.16, Hind femur 12.21

Male: Body length 15.84, Tegmina 18.3, Pronotum 0.94, Hind femur 11.25

46. *Trilophidia repleta* (Walker)

Material examined: Arunachal Pradesh, East Siang, Pasighat, 4-II-2009, on grasses, 7♀.

Morphometry: (length in mm)

Female: Body length 20.88, Tegmina 22.2, Pronotum 1.05, Hind femur 13.12

Genus *Aiolopus* Fieber 1853

47. *Aiolopus simulatrix* (Walker)

Material examined: Mizoram, Aizwal, Selesih, 8-II-2009, on grasses, 3♀, 5♂.

Morphometry: (length in mm)

Male: Body length 11.2-11.7, Pronotum 6.4-7.1, Tegmina 17.3-17.7, Hind femur 7.3-7.8

Female: Body length 13.3-13.9, Pronotum 7.1-8.3, Tegmina 22.3-23.1, Hind femur 11.3-11.7

48. *Aiolopus thalassinus* (Fabricius)

Material examined : Arunachal Pradesh, East Siang, Pasighat, 4-II-2009, on grasses, 2 ♀, 2♂.

Morphometry:

Female: Body length 21.56, Tegmina 24.41, Pronotum 1.36, Hind femur 13.69

Male: Body length 16.89, Tegmina 19.79, Pronotum 0.85, Hind femur 11.69

Genus *Sphingonotus* Fieber

49. *Sphingonotus rubescens*

Material examined : Arunachal Pradesh, East Siang, Pasighat, 3-II-2009, on grasses, 2♀.

Morphometry: (length in mm)

Female: Body length 20.16, Tegmina 18.75, Pronotum 0.70, Hind femur 11.14

Genus *Heteropternis* Stal

50. *Heteropternis respondens* (Walker)

Material examined: Arunachal Pradesh, East Siang, Pasighat, 31-I-2009, on grasses, 2♀. Mizoram, Aizwal, Selesih, 8-II-2009, on grasses, 4♀, 2♂.

Morphometry: (length in mm)

Female: Body length 26.7, Tegmina 25.23, Pronotum 02.4, Hind femur 15.45

Male: Body length 18.12, Tegmina 21.05, Pronotum 1.72, Hind femur 12.67

Genus *Dittopternis* Saussure

51. *Dittopternis venusta* (Walker)

Material examined: Arunachal Pradesh, East Siang, Pasighat, 2-II-2009, on grasses, 6♀.

Morphometry: (length in mm)

Female: Body length 25.25, Tegmina 24.24, Pronotum 2.12, Hind femur 15.48

Genus *Scintharista* Saussure

52. *Scintharista notabilis*

Material examined: Tripura, Agartala, Mohanpur, 15.II.2009, on grasses, 2♀.

Morphometry:

Female: Body length 20.88, Tegmina 22.2, Pronotum 1.05, Hind femur 13.12

Genus *Chloebora* Saussure

53. *Chloebora marschalli* (Henry)

Material examined: Mizoram, Aizwal, Selesih, 8-II-2009, on grasses, 2♀.

Morphometry: (length in mm)

Male: Body length 19.00, Tegmina 22.67, Pronotum 2.23, Hind femur 13.24

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Female genitalia in some Indian species of Acridoidea (Orthoptera) and their taxonomic significance

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Abstract. Female genitalia were studied in 19 Indian species of grasshoppers (Acridoidea) representing 17 genera belonging to nine subfamilies and threefamilies, Pyrgomorphidae, Acrididae and Catantopidae. The taxonomic significance of supra-anal plate, subgenital plate, spermatheca and ovipositor has been evaluated. Presence or absence and tubular or sac-like condition of preapical diverticula of spermatheca, and rudimentary or well developed condition of egg-guide are taken as stable characters for separating various families. Long or short condition of apical diverticulum of spermatheca, presence or absence of setae on posterior margin and Jannone's organs on subgenital plate, and slender or broad condition of ovipositor valves are taken as stable characters for separating various subfamilies. Length of ovipositor valves in relation to lateral apodeme and shape of posterior margin of subgenital plate are suggested as useful generic characters. Shape and size of ovipositor valves, shape of egg-guide of subgenital plate, and presence of protuberance on preapical diverticulum are taken as specific characters. These characters along with already recognized conventional characters have made the identification of families, subfamilies, genera and species more stable and practicable.

Female genitalia, Indian species, Acridoidea, Orthoptera

Introduction

Comparative study has been done of female genitalia with reference to subgenital plate (Fig.1A), supra-anal plate and cerci (Fig. 1D), ovipositor (Fig. 1B) and spermatheca (Fig. 1C) for better understanding of the significance of morphological structures. Supra-anal plate of female is the 10th tergite known as epiproct. Structure of the supraanal plate and cerci is regarded as generic as well as specific character (Uvarov 1966). Usmani & Ajaili (1998) have shown the taxonomic significance of female subgenital plate, supra-anal plate and cerci in some Libyan grasshoppers. The subgenital plate of female is the 8th sternite. It is usually much longer than wide. Usmani (2005) has shown the taxonomic significance of female subgenital plate in some Indian grasshoppers. The spermatheca is also known as receptaculum seminis. It is an essential part of female reproductive system, in which the spermatozoa are stored and can be ejected upon eggs as the later are passed from the oviduct. The taxonomic significance of spermatheca in various subfamilies of Acrididae is already known (Slifer 1939, 1940a, b, c, 1943, Katiyar 1956, Dirsh 1957, Meinodas et al. 1982, Gardner 2004). Ovipositor is an intromittent organ for the process of deposition of eggs. It consists of three parts of valves, dorsal, mesial and ventral. Dorsal valves are basally articulated with lateral apodeme. Usmani & Shafee (1982) have shown the taxonomic significance of ovipositor in some Indian species of Acrididae, which has been used very often as a character in different levels of taxa. Recently Usmani (2009) has studied male and female genitalia in some Libyan species of Acrididae and has shown significance of all parts of male and female genitalia in the taxonomy of the group.

Keeping in view the taxonomic importance of supra-anal plate, subgenital plate, spermatheca and ovipositor, we have made an attempt to compare these structures in 19 Indian species belonging to 17 genera, nine subfamilies and three families of Acridoidea. The genera and species studied are assigned under the respective families and subfamilies.

Material and methods

Adult female grasshoppers were collected from different regions of India to study the morphology of the genitalic parts that served as basis for the present critical study. A complete record was also maintained, indicating the reference number, locality, dates of collection, names of host plants, etc.

Preparations for genitalic studies

For a detailed study of the various components of genitalia, the apical parts of female bodies were cut off and boiled in 10% KOH for a variable period till the material became transparent (usually about 10 minutes) to remove unsclerotized and non-chitinous tissues. They were then thoroughly washed in tap water for complete removal of KOH and examined in 70% ethyl alcohol on a cavity slide. Later, every specimen was dissected under a binocular microscope with the help of fine needles to separate the supra-anal plate and cerci, subgenital plate, ovipositor and spermatheca. The normal process of dehydration was adopted and clearing was done in clove oil. The genitalic structures were mounted separately on cavity slides in canada balsam. A 22 mm square cover-glass over the cavity of the slide was normally used when examining the supra-anal plate and subgenital plate. This was done to prevent them from curling upwards and inwards at the edges. The ovipositor was mounted in canada balsam on another cavity slide oriented to the required position without cover glass. The slides were kept in a slide drier at a temperature of approximately 40°C for about one week to get them completely dry.

The permanent slides were examined under a microscope in order to make a detailed study of the genitalic structures.

Drawings were initially made with the help of a Camera Lucida. Details were then filled in during conventional microscope examination.

The terminology of different parts of female genitalia is based on Dirsh (1965).

Observations and results

Family Pyrgomorphidae Brunner 1874

Subfamily Pyrgomorphinae Brunner 1874

Genus *Pyrgomorpha* Serville 1838

1. ***Pyrgomorpha conica*** **(Olivier 1791)**

Supra-anal plate (Fig. 2A) elongate, angular, broad basally, narrowing apically, longer than wide, apex obtusely rounded; cercus broad, one and half times longer than broad, apex obtusely rounded. Subgenital plate (Fig. 4A) with posterior margin obtusely notched in middle; Jannone's organs present; egg-guide less than twice as long as wide. Spermatheca (Fig. 6A) without apical diverticulum; preapical diverticulum simple, tubular and curved. Ovipositor (Fig. 8A) with dorsal valve slightly more than three times as long as wide, distinctly shorter than lateral apodeme, dorsal edge serrated, apical tip small, dorsal condyle prominent; ventral valve with apical tip pointed; lateral sclerite broad and triangular, basal sclerite well developed, setose on apical half width.

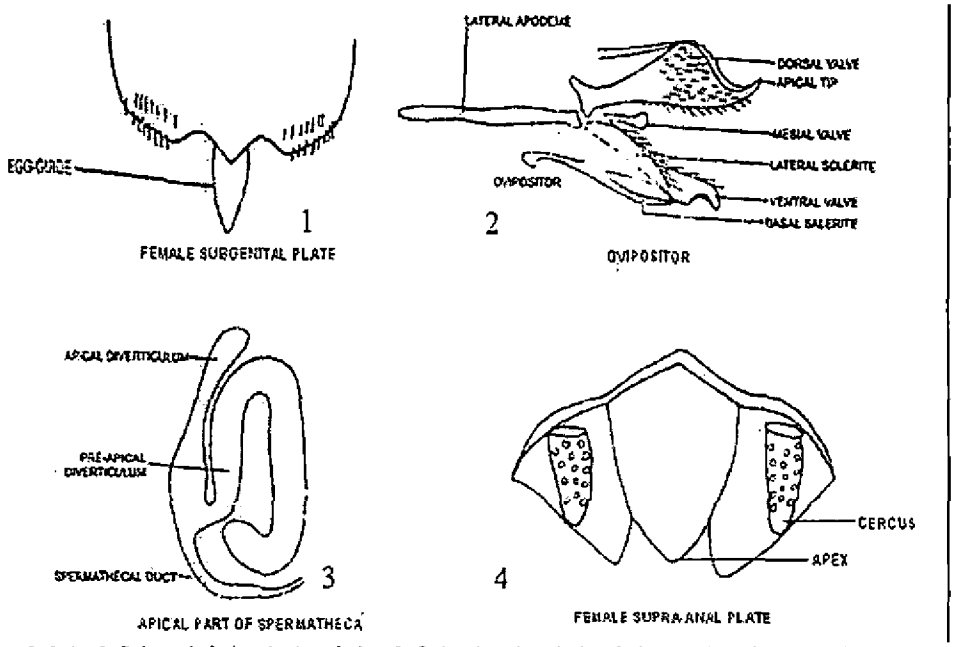


Plate I: 1-4 – 1. Sub genital plate in dorsal view 2. Ovipositor dorsal view 3. Spermatheca in dorsal view 4. Supra-anal plate in dorsal view.

Subfamily Chrotogoninae I. Bolivar 1884
Genus *Chrotogonus* Serville 1839

2.*Chrotogonus trachypterus* (Blanchard 1836)

Supra-anal plate (Fig. 2B) broadly angular, wider than long, apex obtusely conical; cercus broad, incurved, longer than broad, apex rounded. Subgenital plate (Fig. 4B) with posterior margin having a semicircular notch in middle; Jannone's organs absent; egg-guide broad, less than twice as long as wide. Spermatheca (Fig. 6B) without apical diverticulum; preapical diverticulum simple, tubular and curved. Ovipositor (Fig. 8B) with dorsal valve two and half times as long as wide, shorter than lateral apodeme, apical tip long and pointed, dorsal edge tuberculate, dorsal condyle less prominent; ventral valve with apical tip pointed; lateral sclerite broad; basal sclerite narrow, setose on apical half.

Family Catantopidae Brunner 1893
Subfamily Oxyinae Brunner 1893
Genus Oxya Serville 1831

3. *Oxya hylaintricata* Stal 1860

Supra-anal plate (Fig. 2E) broadly angular, wider than long; apex broadly rounded, cerci elongate, incurved, twice as long as wide, apex rounded. Subgenital plate (Fig. 4E) with posterior margin truncated in middle; posterior marginal setae absent; Jannone's organs present; egg-guide broad at base, long and narrow apically. Spermatheca (Fig. 6E) with apical diverticulum long, bearing a small protuberance at its apical one-fifth; preapical diverticulum

broad and curved, thrice the width of apical diverticulum. Ovipositor (Fig. 8E) with dorsal valve long and narrow, five and half times as long as wide, longer than lateral apodeme, dorsal edge with acute spines, basal sclerite narrow and serrated.

4. *Oxya japonica japonica* (Thunberg 1824)

Supra-anal plate (Fig. 2D) broad basally, narrowing apically, slightly longer than wide, apex obtusely rounded; cercus broad, twice as long as wide, apex obtusely rounded. Subgenital plate (Fig. 4D) with posterior margin straight, setae absent, egg-guide finely ridged, broad at base and slender apically. Spermatheca (Fig. 6D) with apical diverticulum short, shorter than preapical diverticulum; preapical diverticulum well developed and slender. Ovipositor (Fig. 8D) valves long and slender, toothed, dorsal valve much longer than lateral apodeme.

Subfamily Hemiacridinae Dirsh 1956
Genus *Hieroglyphus* Krauss 1877

5. *Hieroglyphus banian* (Fabricius 1798)

Supra-anal plate (Fig. 2G) elongated, longer than wide, broad basally, narrowing apically, apex obtusely rounded; cercus elongate, two and half times as long as wide, apex conical. Subgenital plate (Fig. 4G) with posterior margin having a long conical projection in middle; posterior marginal setae and Jannone's organs present; egg-guide well developed, with long anterolateral arms. Spermatheca (Fig. 6G) with apical diverticulum uniformly long and tubular, preapical diverticulum well developed. Ovipositor (Fig. 8G) with dorsal valve moderately broad, three and half times as long as wide, slightly shorter than lateral apodeme, dorsal condyle prominent ; ventral valve with slope deeply concave, lateral tooth well developed, lateral and basal sclerites serrated basally.

6. *Hieroglyphus nigrorepletus* I. Bolivar 1912

Supra-anal plate (Fig. 2F) elongate, broad basally, narrowing apically, longer than wide, apex rounded; cercus elongate, twice as long as wide, apex conical. Subgenital plate (Fig. 4F) with posterior margin setose and a conical projection medially; egg-guide broad at base and slender apically. Spermatheca (Fig. 6F) with apical diverticulum short and broad, shorter than the preapical diverticulum. Preapical diverticulum well developed, uniformly broad and curved medially. Ovipositor (Fig. 8F) with dorsal valve slightly shorter than lateral apodeme, ventral valve with well developed tooth.

Genus *Spathosternum* Karsch 1877

7. *Spathosternum prasiniferum* (Walker 1871)

Supra-anal plate (Fig. 2H) elongate, uniformly broad, narrowing at apex; apex obtusely rounded; cercus slender, uniformly broad, slightly more than twice as long as wide, apex rounded. Subgenital plate (Fig. 4H) with posterior margin having a conical projection in middle; posterior marginal setae and Jannone's organs present; egg-guide broad at base, pointed apically, less than twice as long as wide. Spermatheca (Fig. 6H) with apical diverticulum with basal half broader, shorter than preapical diverticulum. Preapical diverticulum uniformly broad and curved. Ovipositor (Fig. 8H) with dorsal valve moderately broad,slightly more than three times as long as wide, as long as lateral apodeme, dorsal condyle much prominent; ventral valve with slope deeply concave. lateral tooth absent, lateral and basal sclerites smooth.

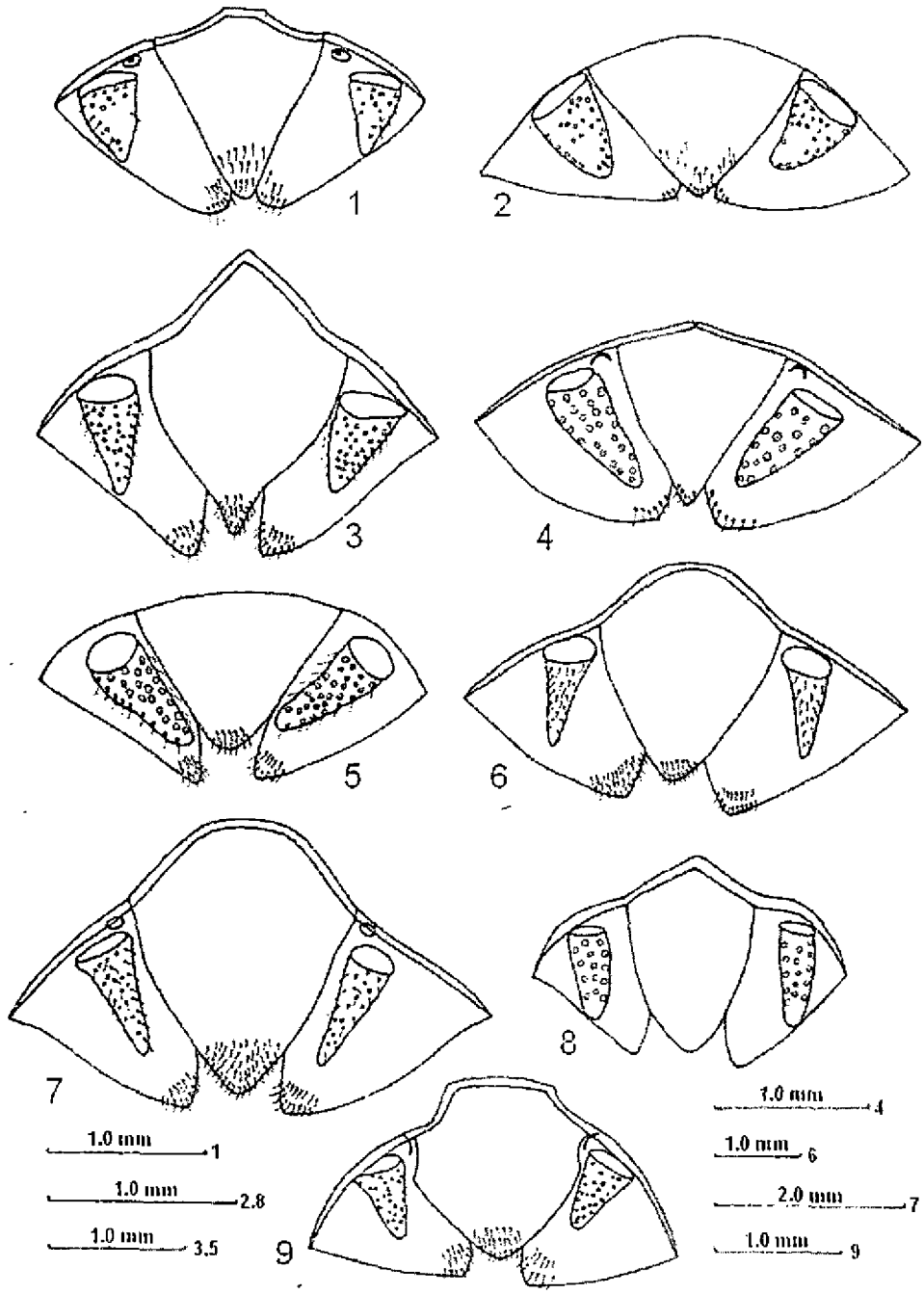


Plate II: 1-9, Female supra anal plate and cerci in dorsal view 1. *Pyrgomorpha conica* **2.** *Chrotogonus trachypterus* **3.** *Catantops pinguis innotabilis* **4.** *Oxya japonica japonica* **5.** *Oxya hyla intricata* **6.** *Heiroglyphus nigrorepletus* **7.** *Heiroglyphus banian* **8.** *Spathosternum prasiniferum* **9.** *Tylotropidius varicornis*

Subfamily Eyprepocnemidinae Brunner 1893
Genus *Choroedocus* I. Bolivar 1914

8. ***Choroedocus robustus*** **(Serville 1838)**

Supra-anal plate (Fig. 3J) wide, flattened, lateral margin curved medially, almost as long as wide, apex obtusely rounded; cercus short, moderately broad; twice as long as wide, apex rounded. Subgenital plate (Fig. 5J) with posterior margin serrated; posterior marginal setae and Jannone's organs absent; egg-guide small, twice as long as wide. Spermatheca (Fig. 6J) with apical diverticulum uniformly broad, shorter than preapical diverticulum, which is broader. Ovipositor (Fig. 9J) with dorsal valve broad, slightly less than three times as long as wide, distinctly longer than lateral apodeme; ventral valve with slope slightly concave, basal sclerite tuberculate at apical half.

Genus *Tylotropidius* Stal 1873

9. ***Tylotropidius varicornis*** **(Walker 1870)**

Supra-anal plate (Fig. 2I) broadly angular, as long as wide, apex obtusely conical; cercus broad basally, narrowing apically, longer than wide, apex rounded. Subgenital plate (Fig. 4I) with posterior margin smooth, with conical projection medially; egg-guide broad at base, abruptly narrowing apically. Spermatheca (Fig. 6I) with apical diverticulum very short, shorter than the preapical diverticulum. Preapical diverticulum apex truncate but well developed. Ovipositor (Fig. 8I) with dorsal valve much shorter than lateral apodeme, apical tip blunt; ventral valve with blunt tooth.

Subfamily Catantopinae Brunner 1893
Genus *Catantops* Schaum 1853

10. ***Catantops pinguis innotabilis*** **(Walker 1870)**

Supra-anal plate (Fig. 2C) elongate, angular, broad basally, abruptly narrowing at apex; apex elongate, conical; cercus broad, apex obtusely rounded. Subgenital plate (Fig. 4C) with posterior margin with a slight projection medially, setose laterally, egg-guide elongate and pointed. Spermatheca (Fig. 6C) with apical diverticulum long and slender, narrower than preapical diverticulum, uniformly broad and bow-shaped. Ovipositor (Fig. 8C) valves short and robust, slightly shorter than lateral apodeum, apex blunt, ventral valve with well developed tooth.

Family Acrididae Latreille 1802
Subfamily Acridinae Latreille 1802
Genus *Acrida* Linnaeus 1758

11. ***Acrida exaltata*** **(Walker 1859)**

Supra-anal plate (Fig. 3K) wide, flattened, as long as wide, apex obtusely rounded; cercus short, longer than wide, apex obtusely rounded. Subgenital plate (Fig. 5K) with posterior margin slightly convex in middle; posterior marginal setae and Jannone's organs absent; egg-guide long, three and half times as long as wide. Spermatheca (Fig. 7K) with apical diverticulum short, apex truncated, shorter than preapical diverticulum; preapical diverticulum sac-like. Ovipositor (Fig. 9K) with dorsal valve broad, slightly more than three times as long as wide, almost as long as lateral apodeme; ventral valve with apical tip short, basal sclerite narrow and tuberculate; mesial valve slightly dilated apically.

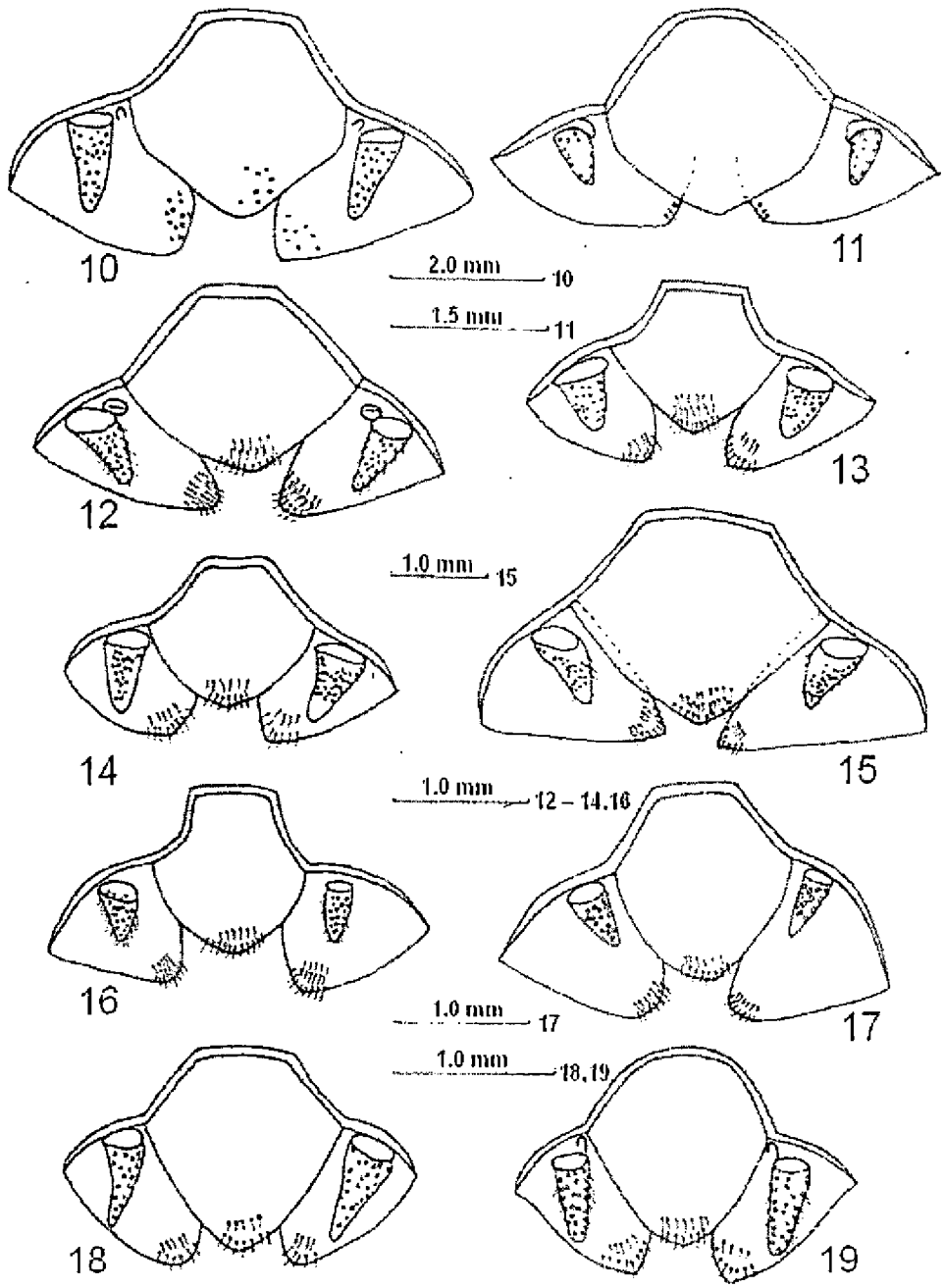


Plate III: 10-19, Female supra anal plate and cerci in dorsal view 10. *Choroedocus robustus* **11.** *Acrida exaltata* **12.** *Phlaeoba infumata* **13.** *Trilophidia annulata* **14.** *Aiolopus simulatrix* **15.** *Oedipoda miniata* **16.** *Acrotylus humbertianus* **17.** *Oedaleus senegalensis* **18.** *Chorthippus indus* **19.** *Leva indica*

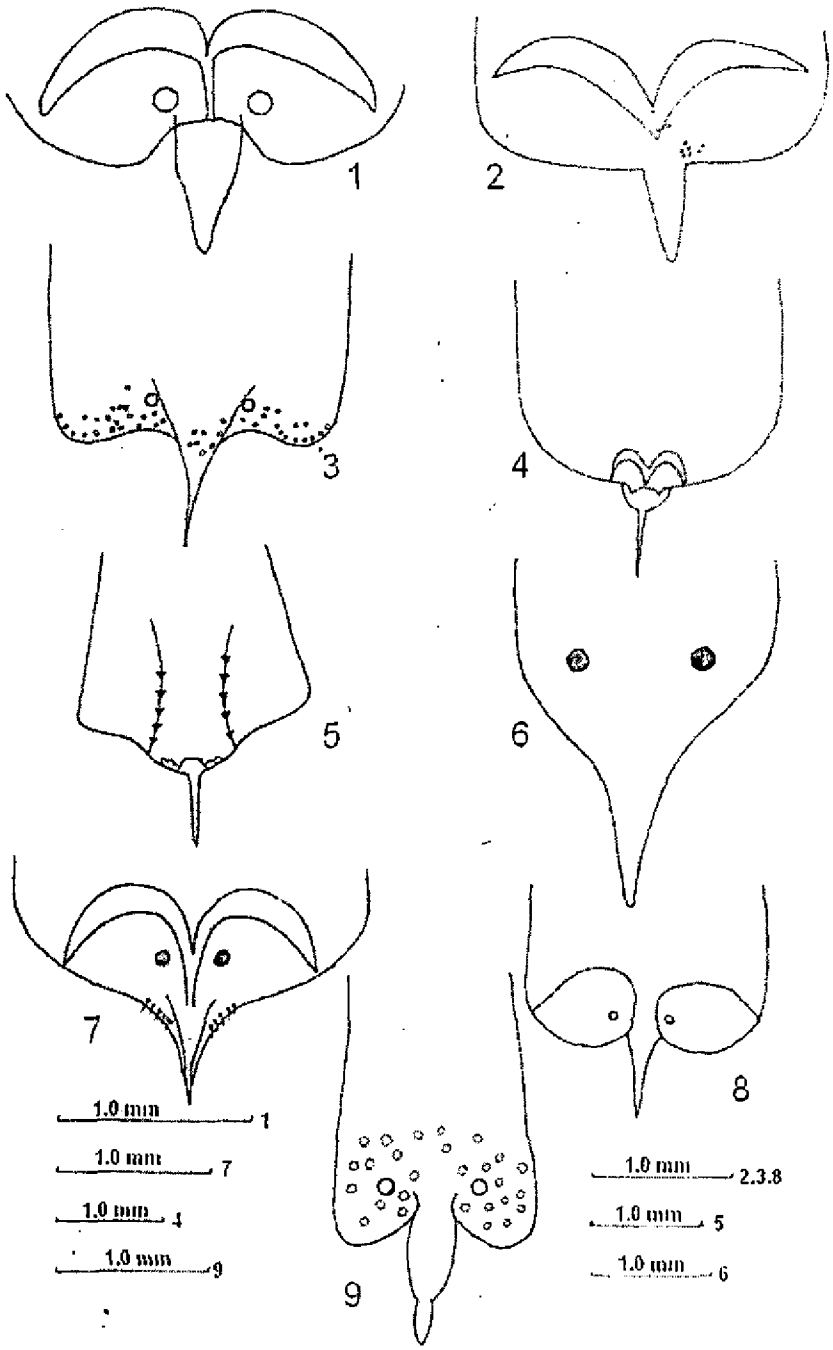


Plate IV: 1-9, Female sub genital plate in dorsal view 1. *Pyrgomorpha conica* 2. *Chrotogonus trachypterus* 3. *Catantops pinguis innotablis* 4. *Oxya japonica japonica* 5. *Oxya hyla intricata* 6. *Heiroglyphus nigrorepletus* 7. *Heiroglyphus banian* 8. *Spathosternum prasiniferum* 9. *Tylotropidius varicornis*

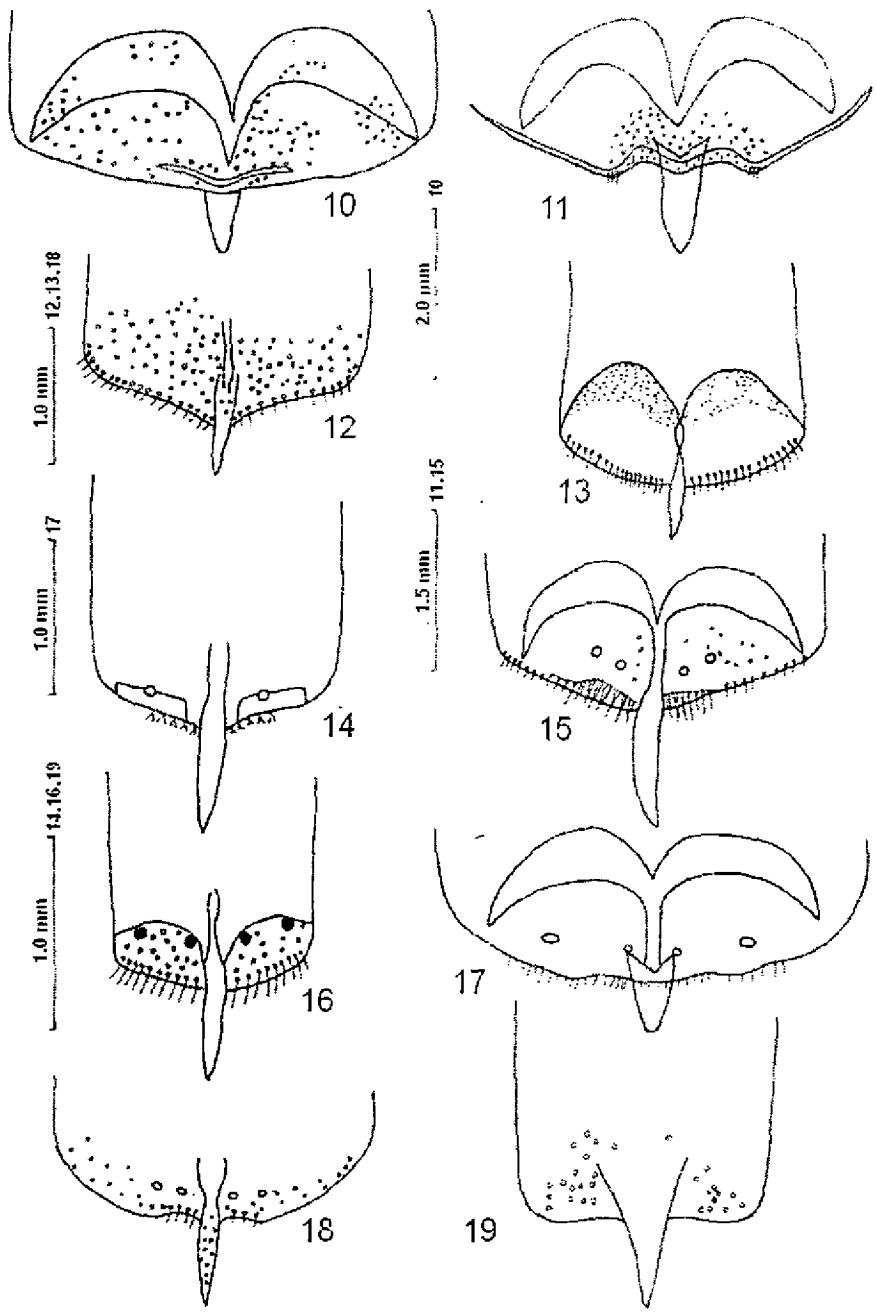


Plate V: 10- 19, Female sub genital plate in dorsal view 10. *Choroedocus robustus* **11.** *Acrida exaltata* **12.** *Phlaeoba infumata* **13.** *Trilophidia annulata* **14.** *Atolopus simulatrix* **15.** *Oedipoda miniata* **16.** *Acrotylus humbertianus* **17.** *Oedaleus senegalensis* **18.** *Chorthippus indus* **19.** *Leva indica*

Genus *Phlaeoba* Stal 1860

12. *Phlaeoba infumata* Brunner von Wattenwyl 1893

Supra-anal plate (Fig. 3L) wide, flattened, wider than long, apex obtusely rounded, cercus short, broad, one and half times as long as wide, apex rounded. Subgenital plate (Fig. 5L) with posterior margin having triangular projection in middle; posterior marginal setae and Jannone's organs absent; egg-guide slightly more than twice as long as wide. Spermatheca (Fig. 7L) with apical diverticulum short and tubercle-like, preapical diverticulum well developed and sac-like. Ovipositor (Fig. 9L) with dorsal valve narrow, slightly more than four times as long as wide, shorter than lateral apodeme; ventral valve with apical tip long and pointed, slope deeply concave, mesial tooth truncated, basal sclerite setose in apical half.

Subfamily Oedipodinae Walker 1870
Genus *Trilophidia* Stal 1873

13. *Trilophidia annulata* (Thunberg 1815)

Supra-anal plate (Fig. 3M) wide, flattened, wider than long, apex obtusely conical; cercus short, broad, longer than broad, apex rounded. Subgenital plate (Fig. 5M) with posterior margin semicircular; posterior marginal setae and Jannone's organs absent; egg-guide broad, more than twice as long as wide. Spermatheca (Fig. 7M) with apical diverticulum short and tubercle-like, preapical diverticulum well developed and sac-like, moderately broad and curved. Ovipositor (Fig. 9M) with dorsal valve moderately broad, slightly more than three times as long as wide, slightly shorter than lateral apodeme, apical tip short and blunt, dorsal condyle not very prominent; ventral valve with apical tip short and blunt, basal sclerite well developed, tuberculate apically.

Genus *Acrotylus* Fieber 1853

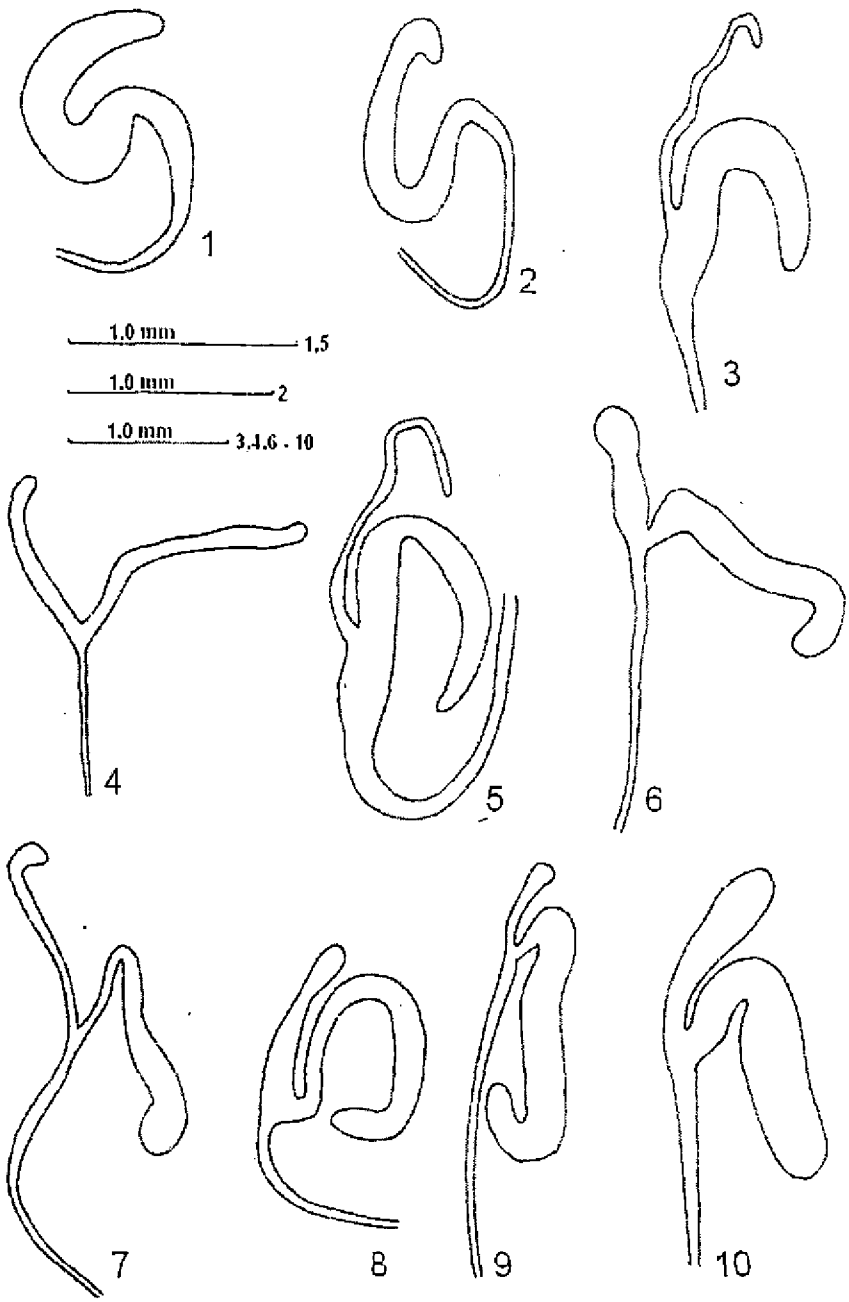
14. *Acrotylus humbertianus* Saussure 1884

Supra-anal plate (Fig. 3P) elongate, as long as wide, apex obtusely rounded; cercus short, slightly less than twice as long as wide, with obtuse apex. Subgenital plate (Fig. 5P) posterior margin almost semicircular, setose; egg-guide long, slender, narrowing apically. Spermatheca (Fig. 7P) apical diverticulum short and tubercle-like, preapical diverticulum well developed and sac-like. Ovipositor (Fig. 9P) dorsal valve broad, less than three times as long as wide, much shorter than lateral apodeme, apical tip long and acute, dorsal condyle very prominent; ventral valve with slope deeply concave, basal sclerite narrow, setose apically.

Genus *Aiolopus* Fieber 1853

15. *Aiolopus simulatrix* (Walker 1870)

Supra-anal plate (Fig. 3N) slightly shorter than wide, apex obtusely rounded; cercus broad, with blunt apex. Subgenital plate (Fig. 5N) with posterior margin of subgenital plate wavy, slightly convex in middle, setose marginally; Jannone's organs streak-like; egg-guide broad basally and narrowing apically, three and half times as long as wide. Spermatheca (Fig. 7N) with apical diverticulum short and tubercle-like; preapical diverticulum well developed and sac-like. Ovipositor (Fig. 9N) with dorsal valve shorter than lateral apodeme, dorsal condyle indistinct, apex acute, ventral valve with pointed tip.



e VI: 1-10, **Spermatheca** 1. *Pyrgomorpha conica* 2. *Chrotogonus trachypterus* 3. *Catantops pinguis tablis* 4. *Oxya japonica japonica* 5. *Oxya hyla intricata* 6. *Heiroglyphus nigrorepletus* 7. *Heiroglyphus banian athosternum prasinlferum* 9. *Tylotropidius varicornis* 10. *Choroedocus robustus*

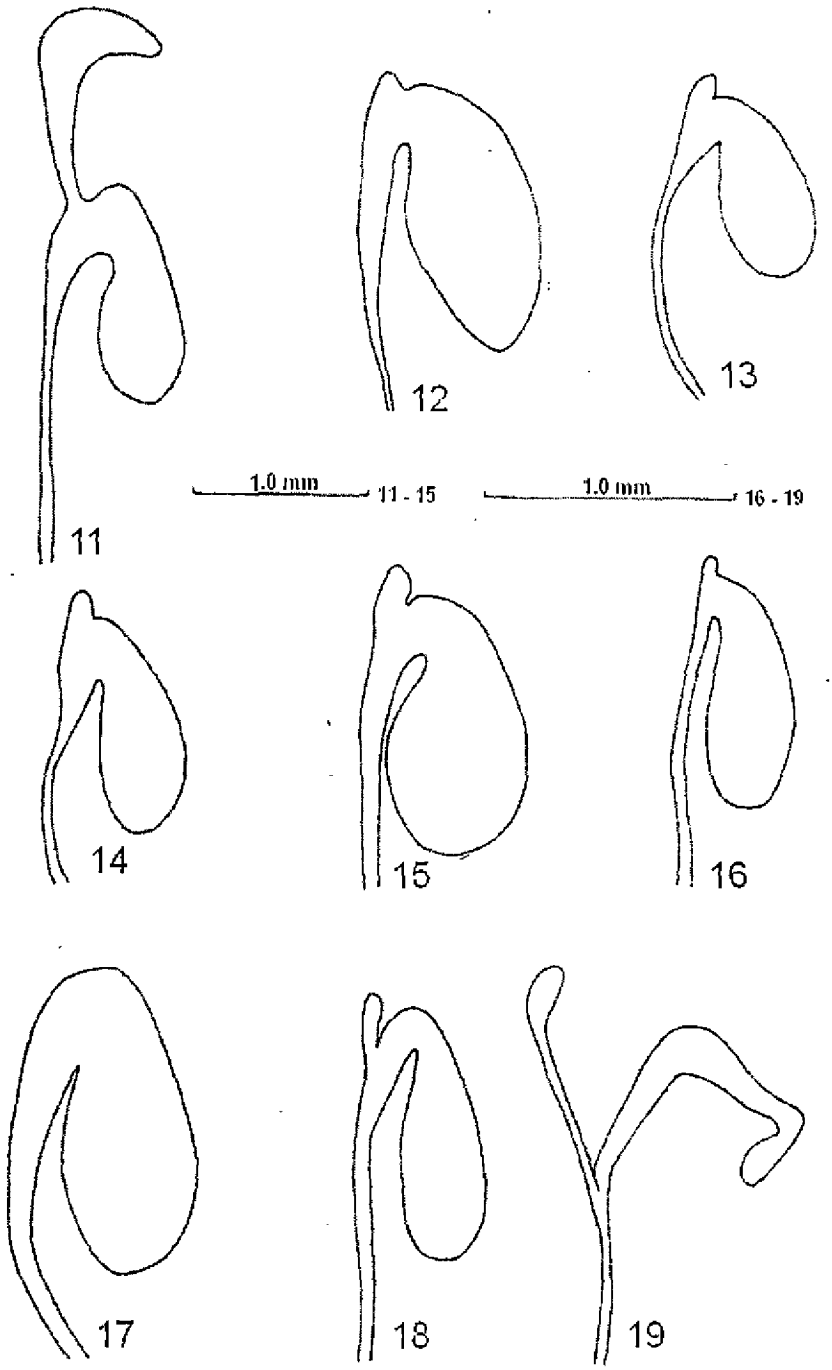


Plate VII: 11-19, Spermatheca 11. *Acrida exaltata* **12.** *Phlaeoba infumata* **13.** *Trilophidia annulata* **14.** *Aiolopus simulatrix* **15.** *Oedipoda miniata* **16.** *Acrotylus humbertianus* **17.** *Oedaleus senegalensis* **18.** *Chorthippus indus* **19.** *Leva indica*

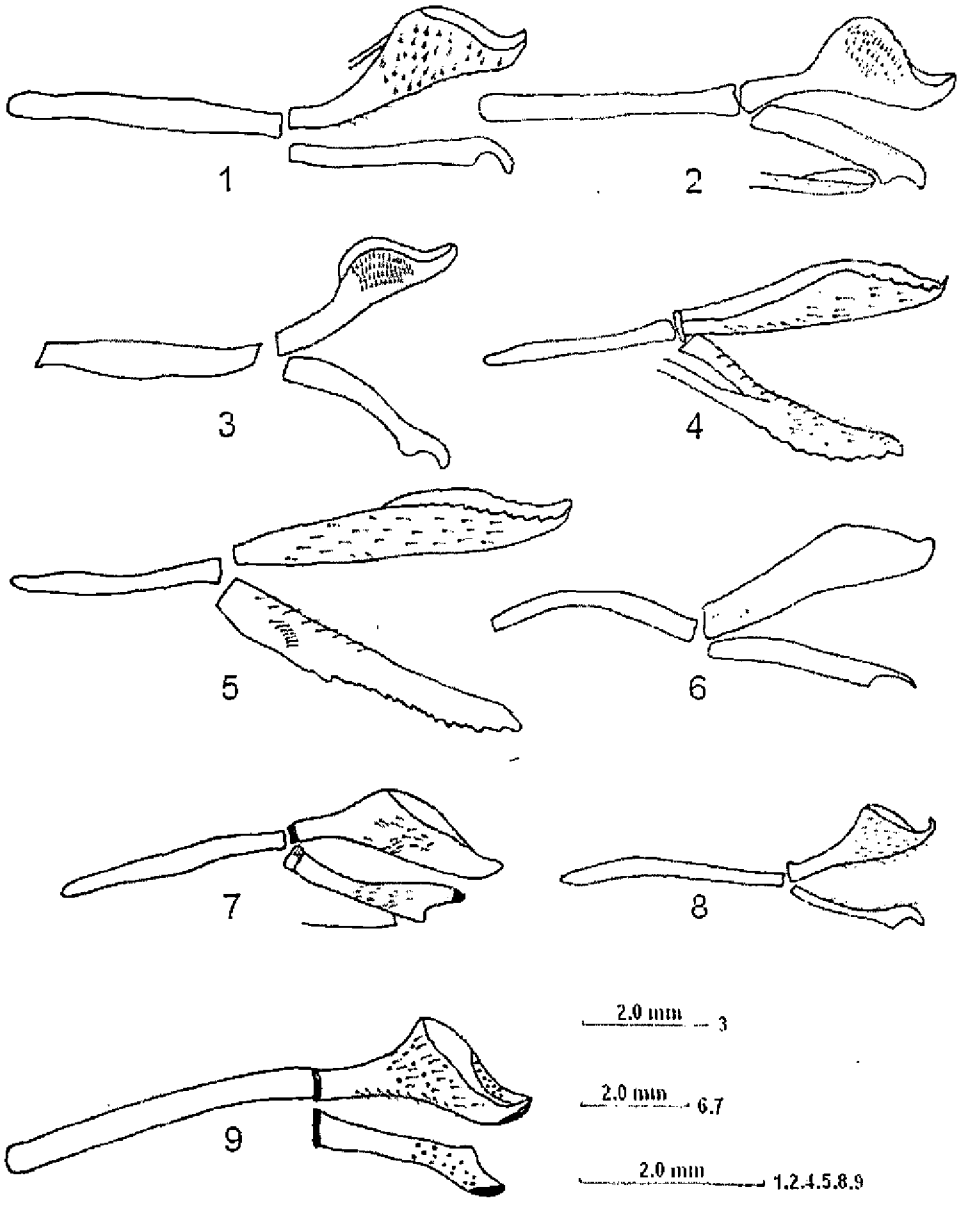


Plate VIII: 1 -9, Ovipositor in lateral view 1. *Pyrgomorpha conica* 2. *Chrotogonus trachypterus* 3. *Catantops pinguis innotablis* 4. *Oxya japonica japonica* 5. *Oxya hyla intricata* 6. *Heiroglyphus nigrorepletus* 7. *Heiroglyphus banians* 8. *Spathosternum prasiniferum* 9. *Tylotropidius varicornis*

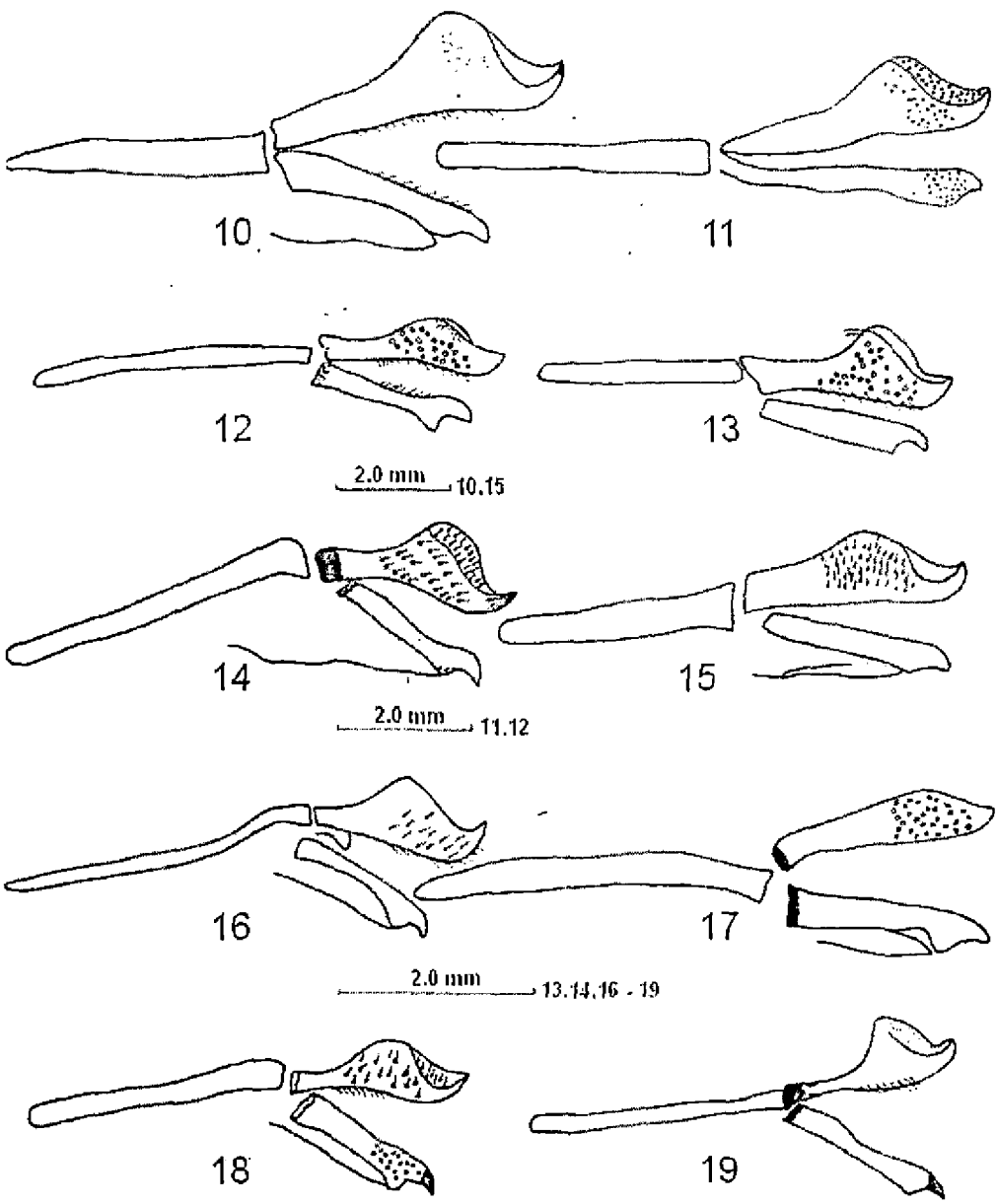


Plate I X: 10-19, Ovipositor in lateral view 10. *Choroedocus robustus* **11.** *Acrida exaltata* **12.** *Phlaeoba infumata* **13.** *Trilophidia annulata* **14.** *Aiolopus simulatrix* **15.** *Oedipoda miniata* **16.** *Acrotylus humbertianus* **17.** *Oedaleus senegalensis* **18.** *Chorthippus indus* **19.** *Leva indica*

Genus *Oedaleus* Fieber 1853

16. ***Oedaleus senegalensis*** (Krauss 1877)

Supra-anal plate (Fig. 3Q) elongate, as long as wide, apex obtusely rounded; cercus short, twice as long as wide, apex obtusely conical. Subgenital plate (Fig. 5Q) with posterior margin broadly circular, wavy, setose; Jannone's organs present; egg-guide short and broad. Spermatheca (Fig. 7Q) without apical diverticulum, preapical diverticulum simple and sac-like. Ovipositor (Fig. 9Q) dorsal valve shorter than lateral apodeme, dorsal condyle less developed, apex blunt, ventral valve with well developed tooth.

Genus *Oedipoda* Latreille 1829

17. ***Oedipoda miniata*** (Pallas 1771)

Supra-anal plate (Fig. 3O) wide, wider than long, apex obtusely conical; cercus short, broad, one and half times as long as wide, apex obtusely rounded. Subgenital plate (Fig. 5O) with posterior margin broadly circular, setose, Jannone's organs present; egg-guide long, slender, narrowing apically. Spermatheca (Fig. 7O) with apical diverticulum short and tubercle- like, preapical diverticulum well developed and baloon-like. Ovipositor (Fig. 9O) short, with slender curved valves, dorsal valve slightly shorter than lateral apodeme, ventral valve with external lateral projection.

Subfamily Gomphocerinae Jacobson & Blanki 1902

Genus *Chorthippus* Fieber 1852

18. ***Chorthippus indus*** Uvarov 1942

Supra-anal plate (Fig. 3R) elongate, as long as wide, broadly angular, apex obtusely rounded, cercus elongate, broad basally, narrowing apically, twice as long as wide, apex elongately conical. Subgenital plate (Fig. 5R) with posterior margin minutely setose and truncated; egg-guide slender narrowing apically. Spermatheca (Fig. 7R) with apical diverticulum short, preapical diverticulum well developed and sac-like. Ovipositor (Fig. 9R) with dorsal valve much shorter than lateral apodeme, apex acute; ventral valve with well developed tooth, apex acute.

Genus *Leva* I. Bolivar 1909

19. ***Leva indica*** (I. Bolivar 1902)

Supra-anal plate (Fig. 3S) elongate, as long as wide, apex obtusely rounded; cercus uniformly broad, twice as long as wide, apex broadly rounded. Subgenital plate (Fig. 5S) with posterior margin truncated, slightly curved medially, without setae and with a conical projection medially. Spermatheca (Fig. 7S) with apical diverticulum elongate, apex bulbous, shorter than preapical diverticulum, which is well developed and curved. Ovipositor (Fig. 9S) with dorsal valve much shorter than lateral apodeme, apex blunt; ventral valve with acute apex.

Discussion

Earlier workers classified Acridoidea mainly based on externally visible conventional characters such as colour, size, texture, number of antennal segments, etc. The recent trend in acridoid systematics is based on genitalic characters. Uvarov (1966) described the

morphology of genitalic structures and emphasized their importance in the classification of Acridoidea. In the present study we attempt to compare genitalic structureswith reference to supra-anal plate and cerci, subgenital plate, spermatheca and ovipositor,which represent the external and internal genitalia of female copulatory organsandin some groups appear to be very stable and reliable.

A comparative study of genitalic structures, particularly of the spermatheca, makes it possible to put forward some suggestions regarding inter-relationships of families and subfamilies of Acridoidea more clearly than using external characters. The subfamilies Catantopinae, Eyprepocnemidinae, Oxyinae, Hemiacridinae, Cyrtacanthacridinae and Calliptaminae are so closely related that earlier and recent workers place all of them in one group. In all of these subfamilies the apical and preapical diverticula of the spermatheca are tubular. The grouping is justified not only by the common character of the spermatheca, but also by the fact that all of the subfamilies (of the Catantopidae) possess a prosternal process.

The subfamilies Catantopinae and Cyrtacanthacridinae are closely related in having the spermatheca with a long and slender apical diverticulum, whereas in the subfamilies Eyprepocnemidinae and Tropidopolinae the spermatheca has the apical diverticulum moderately long and slender.

In Pyrgomorphidae the spermatheca is of variable form, mostly with a single diverticulum, but sometimes with a small or large preapical diverticulum. In the family Acrididae the apical diverticulum is short, rudimentary or sometimes absent, and the preapical diverticulum is sac-like. The sac-like condition of the preapical diverticulum is regarded as an advanced character. This occurs in the subfamilies Acridinae, Oedipodinae, Truxalinae and Gomphocerinae. The grouping of these subfamilies into the family Acrididae is justified by the absence of a prosternal process.

Comparative study of the female subgenital plate in 19 species of Acridoidea reveals that there are certain characters, e.g. rudimentary or well developed condition of the egg-guide and presence or absence of setae on posterior margin of the subgenital plate, that have significant value in separating various subfamilies and families of Acridoidea. Posterior margin entirely setose in the subfamilies Acridinae, Oedipodinae and Gomphocerinae of the family Acrididae, sometimes absent in the latter subfamily; setae confined to posterior lateral margins in the subfamilies Catantopinae, Eyprepocnemidinae and Hemiacridinae belonging to the family Catantopidae; posterior margin without setae in all genera of the family Pyrgomorphidae and subfamily Oxyinae of the family Catantopidae. Shape of posterior margin of the subgenital plate is suggested as a useful and convenient character for identification of genera . Flat or concave, smooth or dentate condition of the ventral surface of the plate are features used for separating various species of *Oxya*. Shape of the supra-anal plate, cerci and subgenital plate, which are regarded as external parts of the female copulatory organs,have significant value in separating various genera and species of Acridoidea.

Comparative study of the ovipositor reveals that there are certain characters, e.g. length of lateral apodeme and shape of ovipositor valves, thathave significant value in separating various genera of Acridoidea. Dorsal valve broad and shorter than lateral apodeme in *Pyrgomorpha, Chrotogonus, Hieroglyphus, Tylotropidius, Oedaleus, Oedipoda, Aiolopus, Acrotylus, Trilophidia, Chorthippus* and *Leva*; dorsal valve narrow and shorter than lateral apodeme in *Phlaeoba* and *Catantops*; dorsal valve broad and longer than lateral apodeme in *Choroedocus*; dorsal valve narrow and longer than lateral apodeme in *Oxya*; dorsal valve broad and as long as lateral apodeme in *Spathosternum* and *Acrida*.

Acknowledgements

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Male genitalia in some Indian species of Acridoidea (Orthoptera)

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ABSTRACT

Male genitalia of fifteen Indian species of grasshoppers representing fifteen genera belonging to nine subfamilies and three families of Acridoidea was studied. The taxonomic significance of supra anal plate, subgenital plate, aedaegus and epiphallus has been evaluated. Presence or absence of dorso-lateral appendages and oval sclerites on epiphallus; divided, undivided or flexured condition of aedeagus, presence or absence of gonopore process on aedeagus are considered important characters for separating various families; smooth or toothed condition of the apex of male cercus, shield or bridge-shaped condition of epiphallus; presence or absence of ancorae on epiphallus, long or short condition of valves of aedeagus are taken as stable characters for separating various subfamilies. shape and length of basal and apical valves of aedeagus, broad or narrow condition of bridge, mono, bi-and trilobate condition of lophi of epiphallus, shape of male supra-anal plate and subgenital plate, are suggested as useful generic characters. Shape of male cercus, apical valve of aedeagus, shape and size of ancorae are taken as specific characters.

Keywords : Significance, genitalia, male, Indian species, acridoidea, orthoptera.

Earlier literature on the systematics of Acridoidea is exclusively based o n conventional characters, namely, shape, size, colouration, texture, number of antennal segments etc. The recent trend in acridoid systematics is mainly based on genitalic characters especially of phallic complex. The present study is based on the conventional as well as genitalic characters, for better understanding of the significance of morphological structures. Comparative study has been done on male genitalia with reference to supra-anal plate and cerci (Fig. 1D), subgenital plate (Fig. 1B), epiphallus (Fig. 1C), and aedeagus (Fig. 1A). The supra-anal plate is also known as epiproct. It is the XIth tergite lying above the paraprocts, representing XIth sternite. The cerci are tubular or plate-like appendages arising between supra-anal plate and paraprocts. Both assiost to grip the female abdomen during the course of copulation. The supra-anal plate is usually triangular and circus is conical but differs greatly in shape and size. Dirsh (1965) gave brief description of male supra-anal plate and cerci in African genera of Acridoidea. Usmani and Ajaili (1994) has shown significance of male supra-anal plate and cerci in some Libyan grasshoppers. The male subgenital plate is XI sternite, half concealed under the epiproct, also known as paraprocts. Ajaili and Usmani (1994) has shown significance of male subgenital plate in some Libyan grasshoppers.The aedeagus is main intromittent organ consisiting of a pair of basal and apical valves. The basal valves are lying above the spermatophore sac and connected by the flexure with the long curved apical valves which are normally concealed under the membranous pallium. During the course of copulation, it is inserted between ventral ovipositor valves of the female into vagina and its tip reaches the spermathecal duct. Dirsh (1965) described five main types of penis in different families of acridoidea. Usmani and Ajaili (1993) has shown the taxonomic significance of aedeagus in some Libyan grasshoppers. The epiphallus is a strongly sclerotised structure located on dorsal side of the phallic organ. It serves to grasp the edge of female subgenital platet fix the phallus firmly during copulation. Its taxonomic significance in various families and subfamilies of acridoidea is already shown. Dirsh (1956) has shown the taxonomic importance of phallic complex particularly the epiphallus in the classification of Acridoidea. Ajaili and Usmani (1990) have shown the taxonomic significance of epiphallus in some Libyan species of grasshoppers.

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Taxonomic significance of male supra-anal plate, subgenital plate and aedeagus has not been shown in Indian species of grasshoppers. Thus in view the taxonomic importance of supra anal plate, subgenital plate, aedeagus and epiphallus, an attempt has been made to compare these structures in fifteen Indian species belonging to fifteen genara, nine subfamilies and three families of Acridoidea. The genera and species studied are assigned under the respective families and subfamilies.

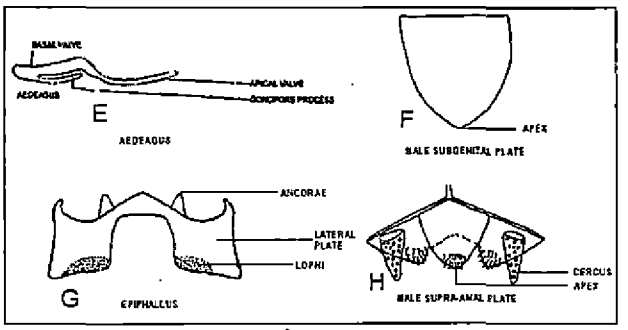

Fig. 1. A-D. A. Aedeagus in lateral view, B. Subgenital plate in dorsal view, C. Epiphallus in dorsal view, D. Supra-anal plate in dorsal view

MATERIALS AND METHODS

Adult grasshoppers of both sexes from different localites of Uttar Pradesh were collected during the period 2006-2008 which served the basis for the present critical study. A complete record was also maintained indicating the reference number, locality, data of collection and name of host plants etc.

Collection of adult grasshoppers : The author surveyed various agricultural areas of Aligarh, during the period 2006-2008 for the collection of grasshoppers and locusts. They were caught by hands, by foreceps, and by the ordinary aerial insect net. The net was used for catching insects individually or by sweeping on grasses, bushes and other vegetables. Since some Acridoidea live on trees, it is sometimes highly rewarding to investigate the branches of trees. Attempts were made to collect the specimens from their host plants as well as those attracted to light during the night. They were captured on different dates in different months from various crops. Different parts of crops were examined. Attention was also given to fruits and vegetables. The collected specimens were killed in cyanide bottles.

Preparations for morphological studies : Dry mounts were also prepared for better understanding of certain characters like size, colour, texture etc. For this purpose, the specimens were first relaxed, stretched and later, they were pinned and labelled. Permanent collections of pinned specimens were kept in store boxes and cabinets for further studies on their morphological structures.

Preparations for genitalic studies : For a detailed study of the various components of genitalia, the apical part of male and female bodies were cut off and boiled in 10% potassium hydroxide for a variable period till the material became transparent (usually about 10 minutes) to remove unscierotized and non-chitinous tissues. They were then thoroughly washed in tap water for complete removal of KOH and examined in 70 percent ethyl alcohol on a cavity slide. Later, every specimen was dissected under a binocular microscope with the help of fine needles to separate various components viz., supra-anal plate and cerci, subgenital plate, epiphallus and aedeagus of male. The normal process of dehydration was adopted and clearing was done in clove oil. The genitalic structures were mounted separately on cavity slides in canada balsam. A 22 mm square cover-glass over the cavity of the slide was normally used when examining the supra-anal plate and subgenital plate. This was made to prevent them from curling upwards and inwards at the edges. The slides were kept in a slide drier at a temperature of approximately 40°C for about one week to get them completely dry. The permanent slides were examined under the microscope in order to make a detailed study of the genitalic structures. Drawings were initially made with the help of a camera lucida. Details were filled in by conventional microscope examination.

RESULTS AND DISCUSSION

Family Pyrgomorphidae Brunner, 1874
Subfamily Pyrgomorphinae Brunner, 1874
Genus Pyrgomorpha Serville, 1838

1. *Pyrgomorpha conica* (Olivier, 1791)

Male genitalia : Supra-anal plate (Fig. 2A) slightly longer than wide, apex elongate broadly rounded; cercus broad basally, narrowing at apical third, more than twice as long as wide, apex obtusely rounded, compressed laterally. Sub genital plate (Fig. 4A) broadly rounded, as long as wide, apex rounded. Epiphallus (Fig. 6A) with dorso-lateral appendages and excurved anterior margin; ancorae absent,

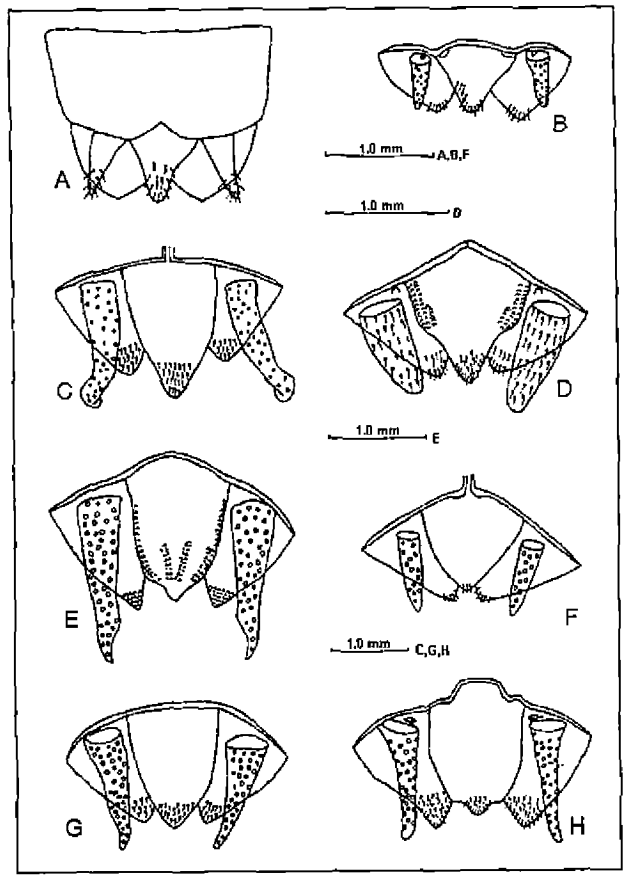

Fig. 2. A-H. Male supra-anal plate and cerci in dorsal view : A. *Pyrgomorpha conica*, B. *Chrotogonus trachypterus*, C. *Catantops pinguis innotablis*, D. *Oxya japonica japonica*, E. *Heiroglyphus nigrorepletus*, F. *Spathosternum prasiniferum*, G. *Tylotropidius varicornis*, H. *Eyprepocnemis alacris*

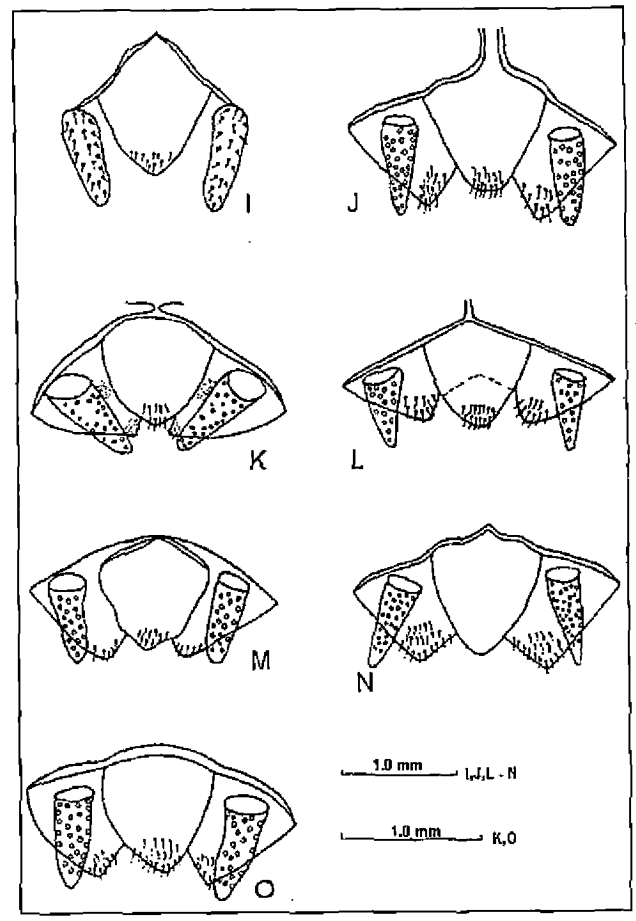

Fig. 3. I-O. Male supra-anal plate and cerci in dorsal view : I. *Acrida exaltata*, J. *Phlaeoba infumata*, K. *Trilophidia annulata*, L. *Aiolopus simulatrix*, M. *Leva indica*, N. *Aulacobothrus luteips*, O. *Ochrilidia geniculata*

lophi curved and hook-like; lateral plates well developed. Aedeagus (Fig. 8A) undivided without flexure; apical valve straight, wide, uniformly much longer than basal valve, apex pointed; basal valve widend laterally.

Subfamily Chrotogoninae I. Bolivar, 1884
Genus Chrotogonus Serville, 1839

2. *Chrotogonus trachypterus* (Blanchard, 1836)

Male genitalia : Supra-anal plate (Fig. 2B) almost as long as wide, lateral margins slightly curved medially, apex obtusely rounded; cercus uniformly broad, as long as wide, with obtuse apex. Sub genital plate (Fig. 4B) uniformly broad, flattened, slightly longer than broad, apex obtusely conical. Epiphallus (Fig. 6B) strongly curved lophi; dorsolateral appendices elongate with pointed tips. Aedeagus (Fig. 8B) undivided, without flexure; apical valve elongate, narrow, much longer than basal valve, apex blunt; basal valve moderatately wide.

Family Catantopidae Brunner, 1893
Oxyinae Brunner, 1893
Genus Oxya Serville, 1831

3. *Oxya japonica japonica* (Thunberg, 1824)

Male genitalia : Supra-anal plate (Fig. 2D) broad triangular, slightly longer than wide, sculptured laterally, apex rounded, cercus broad; two and a half times longer than wide, apex obtusely rounded. Sub genital plate (Fig. 4D) short, broad, wider than long, apex rounded. Epiphallus (Fig. 6D) with bridge narrow and divided, without ancorae, with curved hock-like outer lophi and tooth – like inner lophi. Aedeagus (Fig. 8D) flexured, apical valve straight, wide, shorter than basal valve, connected with basal valve with flexure, apex pointed; basal valve dilated basally.

Subfamily Hemiacridinae Dirsh, 1956
Genus *Hieroglyphus* Krauss, 1877

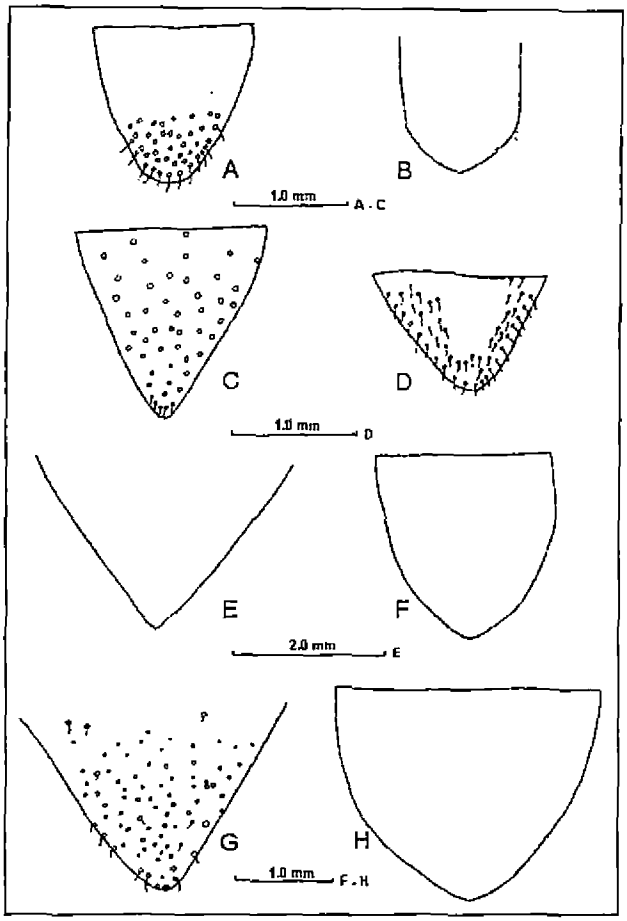

Fig. 4. A-H. Male sub genital plate in dorsal view : A. *Pyrgomorpha conica*, B. *Chrotogonus trachypterus*, C. *Catantops pinguis innotablis*, D. *Oxya japonica japonica*, E. *Heiroglyphus nigrorepletus*, F. *Spathosternum prasiniferum*, G. *Tylotropidius varicornis*, H. *Eyprepocnemis alacris*

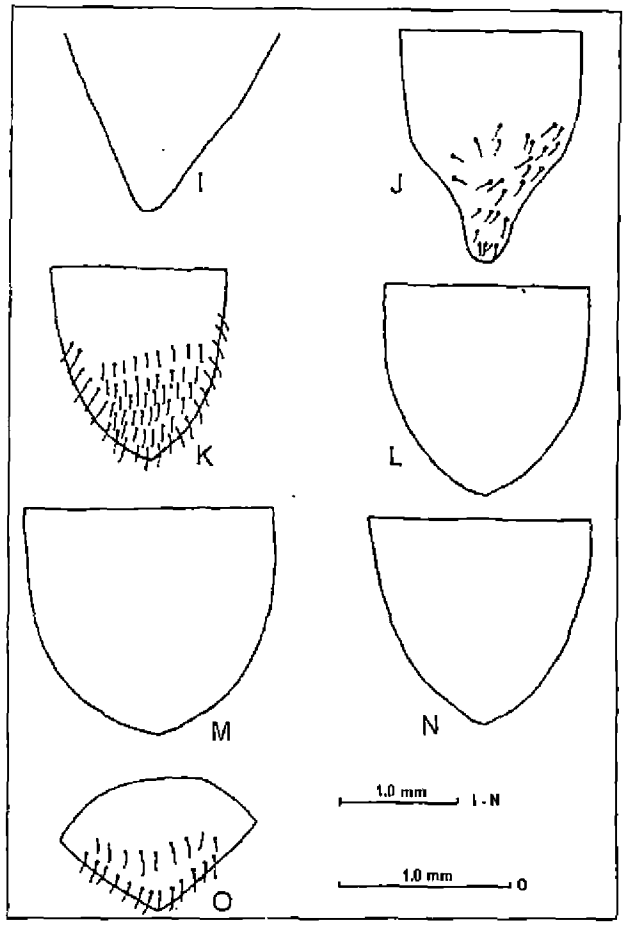

Fig. 5. I-O. Male sub genital plate in dorsal view : I. *Acrida exaltata*, J. *Phlaeoba infumata*, K. *Trilophidia annulata*, L. *Aiolopus simulatrix*, M. *Leva indica*, N. *Aulacobothrus luteips*, O. *Ochrilidia geniculata*

4. *Hieroglyphus nigrorepletus* I. Bolivar, 1912

Male genitalia : Supra-anal plate (Fig. 2E) elongate-angular broad, abruptly narrowing at apex, apex obtuse; cercus elongate, more than three times longer than wide, apex incurved and pointed. Sub genital plate (Fig. 4E) wide, flattened, broader than long, apex obtusely conical. Epiphallus (Fig. 6E) with bridge narrow, concave, ancorae elongate, with acute apices; lophi large. Aedeagus (Fig. 8E) flexured, apical valve narrow, curved, narrower and shorter than basal valve, apex pointed connected with basal valve with flexure, basal valve wide basally.

***Genus Spathosternum* Karsch, 1877**

5. *Spathosternum prasiniferum* (Walker, 1871)

Male genitalia : Supra-anal plate (Fig. 2F) broadly triangular, wide than long, apex obtusely conical; cercus moderately broad, two and a half times as long as wide, apex narrowing apically. Sub genital plate (Fig. 4F) wide, slightly longer than wide, broad basally, narrowing at apex, apex obtusely conical. Epiphallus (Fig. 6F) with wide bridge, ancorae small with bluntly rounded apices and lophi small, rounded. Aedeagus (Fig. 8F) flexured, apical valve narrow, slightly curved, narrower and shorter than basal valve, connected with basal valve with flexure, apex rounded; basal valve moderately broad, of uniform width.

Subfamily Eyprepocnemidinae Brunner, 1893
Genus *Eyprepocnemis* Fieber, 1853

6. *Eyprepocnemis alacris* (Serville, 1839)

Male genitalia : Supra-anal plate (Fig. 2H) uniformly broad, apex rounded, slightly longer than broad; cercus elongate, narrowing apically, more than three times as long as wide, apex excurved, obtusely rounded. Sub genital plate (Fig. 4H) broad, wider than long, narrowing

apically, apex obtusely conical. Epiphallus (Fig. 6H) with narrow bridge, moderately large, incurved ancorae with sub-acute apex and obtuse angular lophi. Aedeagus (Fig. 8H) flexured, apical valve narrow, curved much narrower and shorter than basal valve, connected with basal valve by flexure; apex pointed, basal valve broad and curved basally.

***Genus Tylotropidius* Stal, 1873**

7. *Tylotropidius varicornis* (Walker, 1870)

Male genitalia : Supra-anal plate (Fig. 2G) broadly angular, narrowing apically, longer than wide, apex obtusely rounded; cercus elongate, broad basally, narrowing apically incurved, less than three times as long as wide, apex obtusely conical. Sub genital plate (Fig. 4G) wide, flattened, wider than long, apex obtusely angular. Epiphallus (Fig. 6G) bridge-shaped, ancorae well developed, curved mesially and rather ractangular, large lophi. Aedeagus (Fig. 8G) flexured, apical valve narrow, elongate, curved much narrower and longer than basal valve, connected with basal valve by flexure, apex pointed, basal valve broad basally.

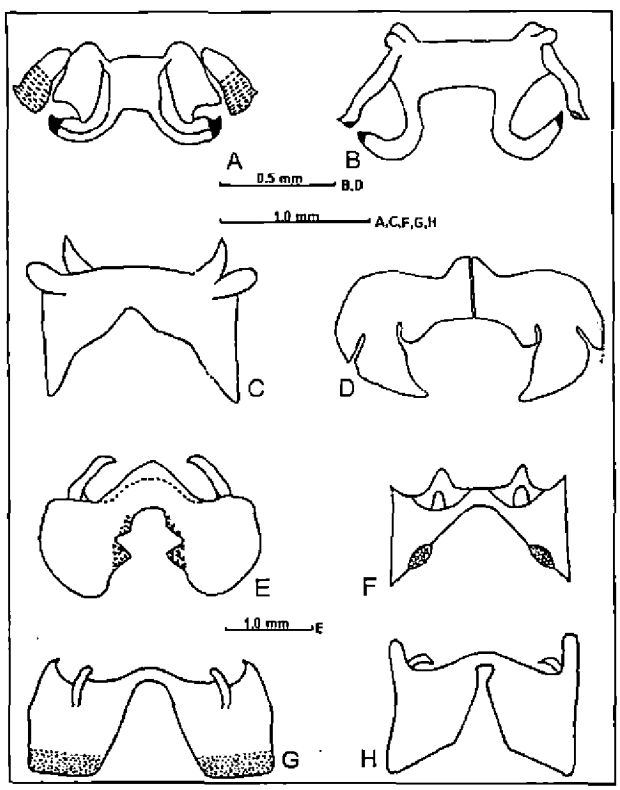

Fig. 6. A-H. Epiphallus in dorsal view : A. *Pyrgomorpha conica*, B. *Chrotogonus trachypterus*, C. *Catantops pinguis innotablis*, D. *Oxya japonica japonica*, E. *Heiroglyphus nigrorepletus*, F. *Spathosternum prasiniferum*, G. *Tylotropidius varicornis*, H. *Eyprepocnemis alacris*

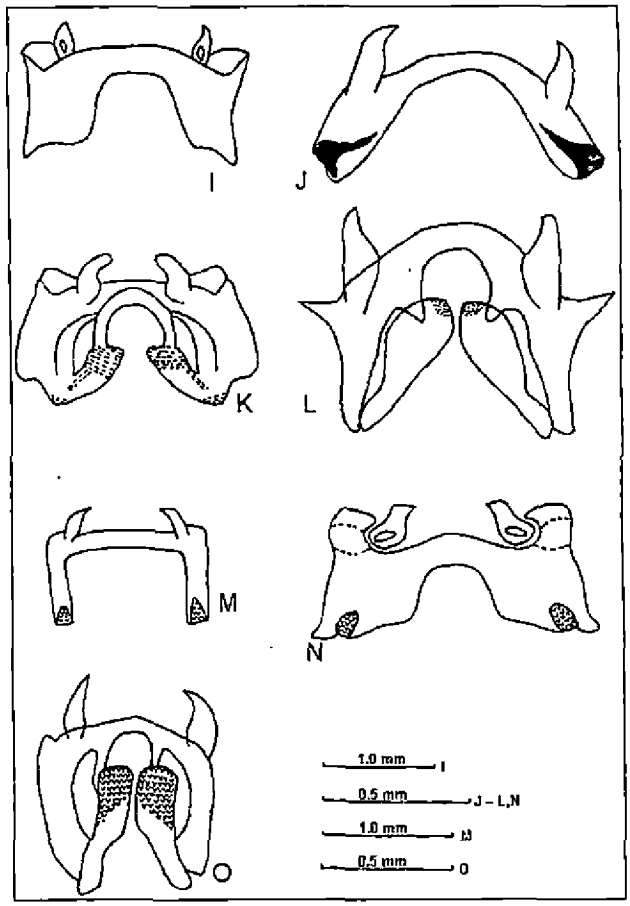

Fig. 7. I-O. Epiphallus in dorsal view : I. *Acrida exaltata*, J. *Phlaeoba infumata*, K. *Trilophidia annulata*, L. *Aiolopus simulatrix*, M. *Leva indica*, N. *Aulacobothrus luteips*, O. *Ochrilidia geniculata*

Subfamily Catantopinae Brunner, 1893
***Genus Catantops* Schaum, 1853**

8. *Catantops pinguis innotabilis* (Walker, 1870)

Male genitalia : Supra-anal plate (Fig. 2C) elongate, broad basally, longer than wide, lateral margins curved apically, cercus wide, more than three and a half times as long as wide, apex excurved, almost truncate. Sub genital plate (Fig. 4C) elongate, flattened, broad basally, narrowing apically, apex obtusely rounded. Epiphallus (Fig. 6C) bridge-shaped with large incurved, rather pointed ancorae, anterior projections large and small lobiform lophi. Aedeagus (Fig. 8C) flexured, apical valve slightly curved, narrower and shorter than basal valve. Connected with basal valve with flexure, apex rounded, basal valve dilated basally.

***Family Acrididae* Latreille, 1802**
Subfamily Acridinae Latreille, 1802
***Genus Acrida* Linnaeus, 1758**

9. *Acrida exaltata* (Walker, 1859)

Male genitalia : Supra-anal plate (Fig. 3i) broadly angular, slightly longer than wide, lateral margins slightly curved medially apex obtusely conical; cercus uniformly broad, less than and three times as long as wide, apex broadly rounded. Sub genital plate (Fig. 5I) elongate-angular, longer than wide, apex obtusely rounded. Epiphallus (Fig. 7I) with moderately broad median bridge, its anterior margin convex with small paired, bilobed, *nodulated lophi and blunt, peglike ancorae. Aedeagus* (Fig. 9I) flexured, apical valve narrow, curved, shorter than basal valve, connected with basal valve with flexure, apex pointed; basal valve broad basally.

Genus *Phlaeoba* Stal, 1860

10. *Phlaeoba infumata* Brunner von Wattenwyl, 1893

Male genitalia : Supra-anal plate (Fig. 3J) broadly triangular, slightly longer than wide, apex broadly rounded; cercus broad, narrowing apically, two and a half times as long as wide, apex rounded. Sub genital plate (Fig. 5J) wide, flattened, broad basally, obtusely narrowing apically, longer than wide, apex elongate, incurved, rounded. Epiphallus (Fig. 7J) with bridge narrow, ancorae moderate, with pointed apices, lophi small, single lobed. Aedeagus (Fig. 9J) flexured, apical valve narrow, strongly curved, upward, much narrower and shorter than the basal valve, apex pointed, basal valve broad and dilated basally.

Subfamily Oedipodinae Walker, 1870
Genus *Trilophidia* Stal, 1873

11. *Trilophidia annulata* (Thunberg, 1815)

Male genitalia : Supra-anal plate (Fig. 3K) broad, short, almost as long as wide, apex obtusely rounded; cercus broad, incurved, more than twice as long as wide, apex rounded. Sub genital plate (Fig. 5K) broad, longer than wide, apex obtusely conical. Epiphallus (Fig. 7K) with narrow bridge, ancorae short with rounded apices, lophi large and bilobed and posterior lobes with a shallow excavation. Hollis (1965) separated this species from *T. conturbata* and *T. cinnabarina* on the basis of epiphallus. Aedeagus (Fig. 9K) flexured, apical valve narrow, straight, much narrower and much shorter than basal valve, apex pointed; basal valve broad medially.

Genus *Aiolopus* Fieber, 1853

12. *Aiolopus simulatrix* (Walker, 1870)

Male genitalia : Supra-anal plate (Fig. 3L) broadly angular, rounded, lateral margins curved medially, apex rounded; cercus elongate-conical, almost twice as long as wide with obtuse apex. Sub genital plate (Fig. 5L) broad, almost as long as wide, apex obtusely conical. Epiphallus (Fig. 7L) with bridge moderately narrow, undivided; ancorae moderately broad, curved and pointed at tips; lophi lobiform, lateral plates and their anterior projections well developed. Aedeagus (Fig. 9L) with apical valve moderately broad, curved, much narrower and shorter than basal valve; connected with basal valve by flexure, apex blunt; basal valve much broader basally.

Subfamily Gomphocerinae Jacobson & Blanki, 1902
Genus *Ochrilidia* Stal, 1873

13. *Ochrilidia geniculata* (I. Bolivar, 1913)

Male genitalia : Supra-anal plate (Fig. 3O) elongate-angular, as long as wide, apex conical, cercus elongate, narrow conical, two and a half times as long as wide with obtuse apex. Sub genital plate (Fig. 5O) short, triangular, wider than long, apex obtusely conical. Epiphallus (Fig. 7O) with bridge narrow, undivided; ancorae moderate, acute, lophi trilobate. The same species was described by Dirsh (1956), and Mishchenko (1986). Aedeagus (Fig. 9O) flexured, apical valve narrow, curved, narrower and slightly shorter than basal valve, connected with basal valve by flexure, apex pointed; basal valve moderately broad.

Genus *Leva* I. Bolivar 1909

14. *Leva indica* (I. Bolivar, 1902)

Male genitalia : Supra-anal plate (Fig. 3M) broad, short, as long as wide, lateral margins curved medially, apex

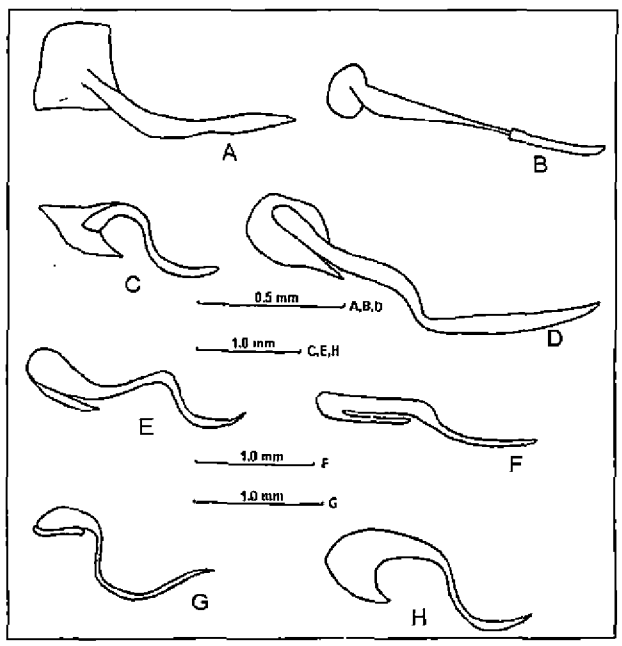

Fig. 8. A-H. Aedeagus in lateral view : A. *Pyrgomorpha conica*, B. *Chrotogonus trachypterus*, C. *Catantops pinguis innotablis*, D. *Oxya japonica japonica*, E. *Heiroglyphus nigrorepletus*, F. *Spathosternum prasiniferum*, G. *Tylotropidius varicornis*, H. *Eyprepocnemis alacris*

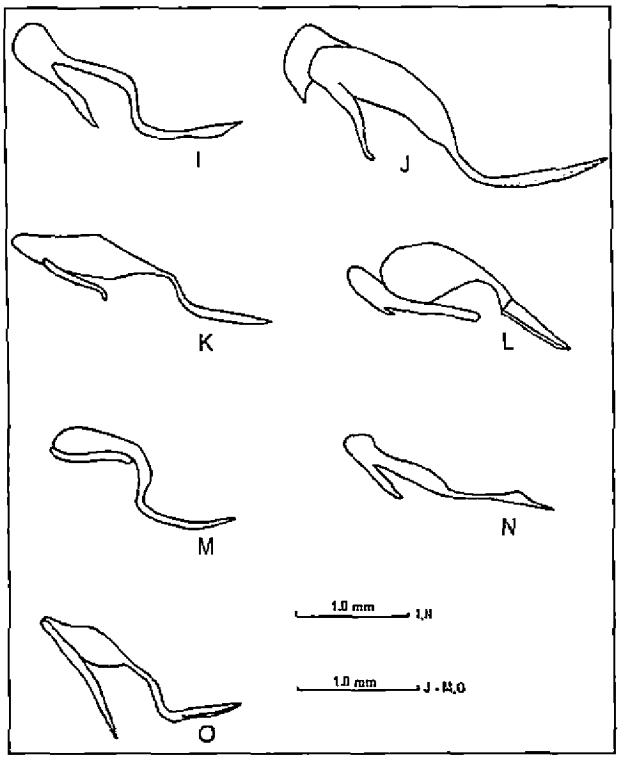

Fig. 9. I-O. Aedeagus in lateral view : I. *Acrida exaltata*, J. *Phlaeoba infumata*, K. *Trilophidia annulata*, L. *Aiolopus simulatrix*, M. *Leva indica*, N. *Aulacobothrus luteips*, O. *Ochrilidia geniculata*

obtusely rounded; apex uniformly broad, two and a half times as long as wide, apex rounded. Sub genital plate (Fig. 5M) wide, flattened, slightly wider than long, apex obtusely conical. Epiphallus (Fig. 7M) with bridge narrow, undivided, ancorae short with pointed apices; lophi small, single lobed. Aedeagus (Fig. 9M) flexured, apical valve narrow, curved, narrower and slightly shorter than basal valve, connected with basal valve with flexure; apex pointed; basal valve moderately broad basally.

Genus *Aulacobothrus* I. Bolivar, 1902

15. *Aulacobothrus luteips* (Walker, 1871)

Male genitalia : Supra-anal plate (Fig. 3N) broad basally, narrowing apically, slightly longer than wide, apex rounded; cercus elongate, broad basally, narrowing apically, slightly less than three times as long as wide, apex conical. Sub genital plate (Fig. 5N) broad, narrowing apically as long as wide, apex obtusely conical. Epiphallus (Fig. 7N) with bridge narrow, curved, undivided; ancorae large with pointed apices; lophi elongate. Aedeagus (Fig. 9N) flexured, apical valve narrow, straight, narrower and slightly shorter than basal valve, connected with basal valve by flexure, apex sharply pointed, basal valve moderately broad basally.

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